# Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

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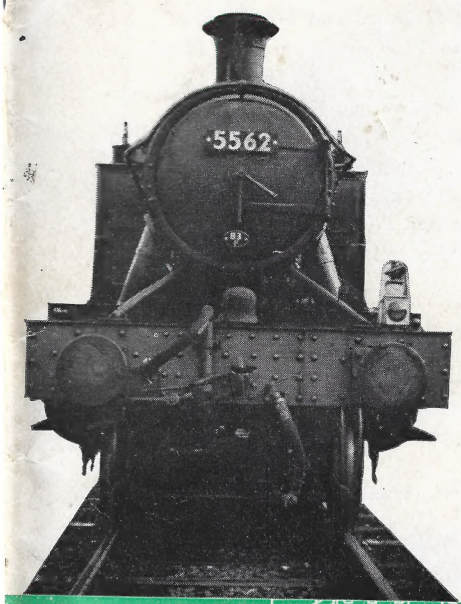


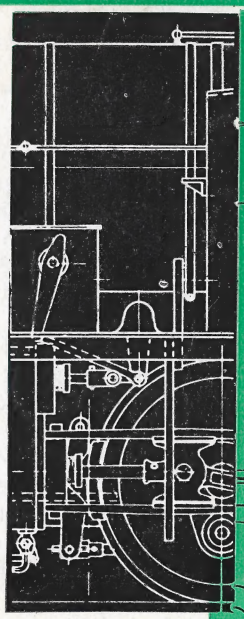

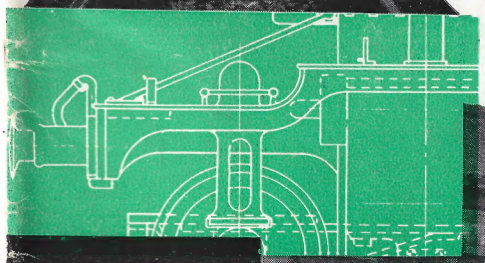

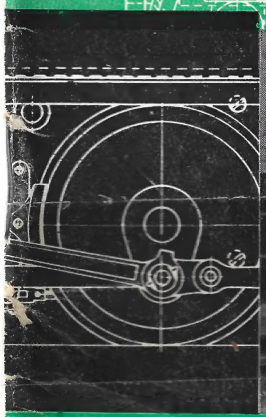

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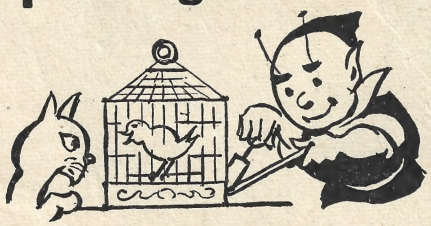
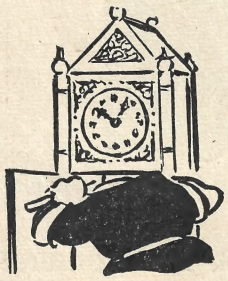


## (c) keep things GOING...



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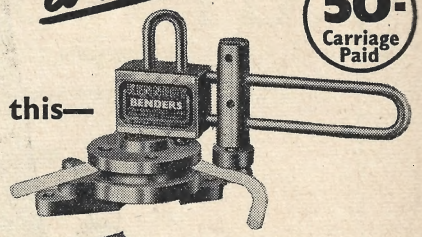

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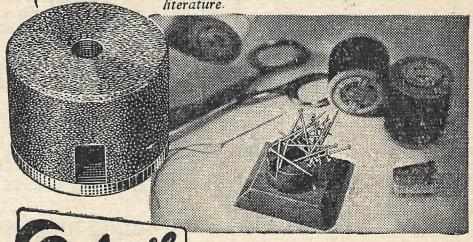

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# Model Engineer

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### COVER PICTURE

*The GWR Prairie tank 45XX is the subject upon which Martin Evans has based "Firefly," the new ME locomotive project. The second article in the series describing its construction is on pages 172 to 174.*


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## A WEEKLY COMMENTARY

# Smoke Rings

By VULCAN

THE final stage was reached last month in Ian Fraser's programme. Readers will recall the indomitable Scot's battle with officialdom when he was originally refused planning permission to build an engine house for his 60-year-old Marshall compound traction engine alongside his new home in Viewfield Road, Arbroath.

The story, and the final outcome when his appeal went before the Secretary of State for Scotland, was told by Kenneth Barrett in MODEL ENGINEER for 26 November 1959. As recently as December 22 I related how Mr Fraser moved into his new house, the occasion being appropriately celebrated by his driving the Marshall into its "Palance."

Now comes the last stage—a 2 ft gauge garden track on which will run a favourite engine of Mr Fraser's, a diminutive pug engine which he has acquired from the Scottish Gas Board.

The 0-4-0 locomotive, designed by the great Dugald Drummond, was built 60 years ago by Kerr Stuart of Stoke-on-Trent. The Gas Department of Dundee bought it in 1902 and for 57 years the little engine gave an excellent account of itself.

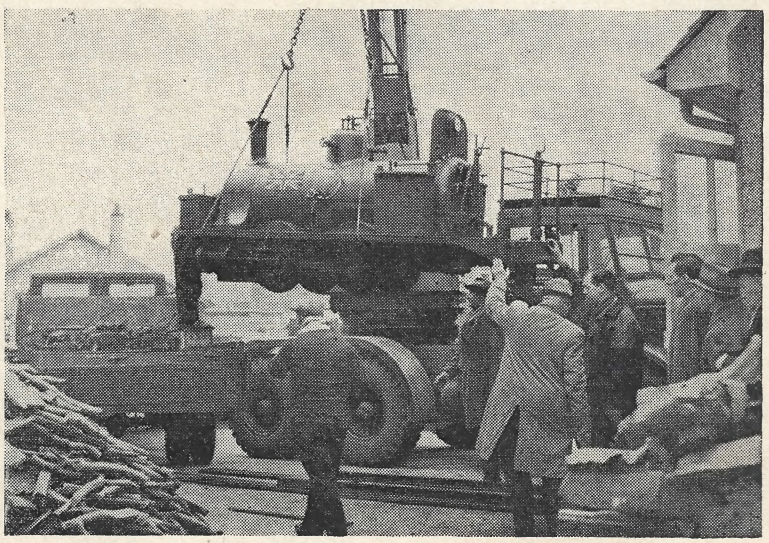
*Bonnie Dundee*, as Mr Fraser has christened his new acquisition, was not alone in the gas works. She had a sister. When the decision to scrap the two of them was taken—a sad moment, admit the Gas Board officials—two offers were promptly made for their preservation.

Mr Ian Fraser acquired No 720; the other has gone to the Tal-y-Llyn Railway Museum at Towyn Wharf. This, I think, is a highly satisfactory solution all round.

*Bonnie Dundee* is typical of the 2 ft gauge locomotives operated by many gas works. Large numbers of them were built. Some served in Tradeston, Dalmarnock, and Dawsholm in Glasgow.

The garden track for the little pug has yet to be laid. But with a man like Mr Fraser the plan is as good as the deed.

*The Arbroath Herald*, which has faithfully recorded the events attending Mr Fraser's efforts to build his own traction engine house and lay a garden track, devoted a page to the ceremony of handing over the engine.



*Ian Fraser, in overalls, watches the unloading of* BONNIE DUNDEE

## Rolling home

IF you win the pools this week, here is your chance to celebrate by driving your own steam roller.

I hear from an authoritative source that Mr H. V. Dobson, of Rowmes Lane, Swinton, near Mexborough, Yorkshire, wishes to dispose of his Aveling and Porter steam roller.

Full details of it were not available as we went to press, but I understand that it is No 10915, that it weighs approximately 11 tons and was last at work four months ago, when it was in perfect order. The boiler was inspected as recently as 1958.

Steam rollers are rare captures these days. One in perfect working order is quite something.

## The giant haul

ARE your listening, live-steamers ? It is a demonstrable fact that a 2½ in. gauge model steam locomotive can haul two adults; it has been proved that a gauge O steam engine can pull a truck carrying a heavy man.

But would you believe anyone who said that a standard production Hornby Dublo locomotive could haul a child weighing two and a half stones sitting on a truck weighing half a stone—a total of 42 lb. ?

I would have discredited such a statement had I not seen the evidence—and that was produced by Meccano Ltd at a recent press show in Mayfair.

## Special track

A free running truck to carry the child was set on rails straddling a single Dublo two-rail track. Motive power was provided by a model of a BR standard diesel Co-Co equipped with the new ring-field motor.

Michael Nixon, who we were assured weighed two stone seven pounds, was lifted on to the truck, the electrical circuit was closed, and away glided the unusual train.

Michael was replaced by Simon scaling "four stone and a bit," the train was double-headed, and another mammoth load was despatched.

Then it was Glenna Ferdinando, a shapely eight stone, who was driven triple-headed along the demonstration platform which was appropriately supported by Meccano piers.

## Controlled power

Nothing had been done to the locomotives; even the standard couplings remained. The only concession to the diminutive power unit was a spring-loaded tow bar attached to the truck.

Though the demonstration is not intended to prove that with a quadruple-headed truck you could haul auntie round the dining room table, it does show conclusively that the new motor develops fantastic power—and what is more, controlled power—at low speed.

Such a characteristic makes the operation of Dublo trains arriving and leaving stations all the more realistic.

## Those special materials

MANY readers experience difficulty in obtaining small supplies of materials which are outside the normal lines offered by our advertisers. A great deal of time and trouble by the ME Queries Service is devoted to attempts to help readers in difficulty.

It is usually possible to find the manufacturer or wholesale distributor of the required product, but quite another thing to find a supplier willing to oblige by selling them in small enough quantities.

Some companies inform us that consignments of goods below a certain minimum value, so far from being profitable, are a dead loss, and that small orders would only be practicable by setting up a special retail sales organisation.

## May be worth while

While this difficulty is readily appreciated, I am sure, on the strength of experience, that consideration for the small buyer would be worth while in the long run.

On many occasions, small orders have led to large ones; the prototype or development stage in a new product is often only possible if small quantities of the required materials can be obtained.

Some inventions which have had far-reaching effects in industry could never have materialised at all, had not someone been willing to oblige by supplying the bits and pieces for the "one-off" experimental model.

### Next week

*The first constructional article in the* ROB ROY *serial will appear next week. A complete set of plans is already available (price 22s. 6d.) and those who wish to enter the competition associated with this model locomotive can get off to an early start.*

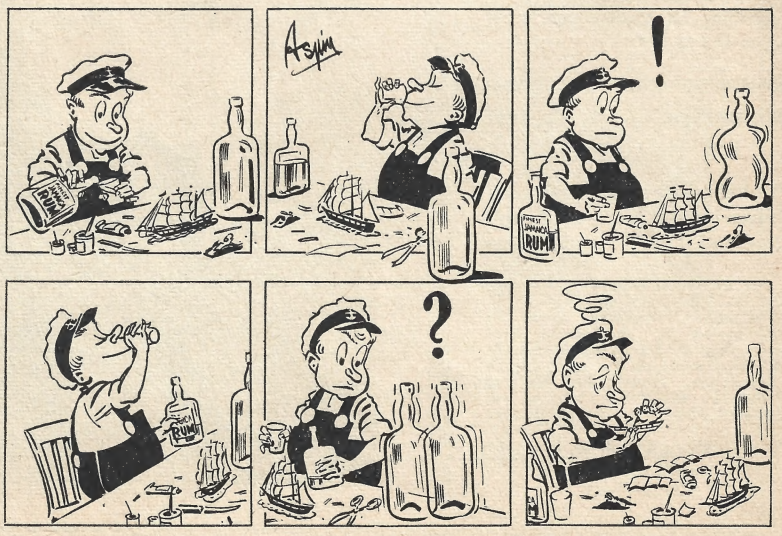
## Patient doing fine

THERE was a good, crisp tone in the voice that answered my telephone call and I knew before I put the question that Mr Bowness was very much better.

He is doing the sensible thing and following the advice of his doctor. Though he apparently seems well enough to move about again he is wisely keeping to his bedroom, but he gets up now and again for a spell of reading in an easy chair.

When he is fit he will be off to Wiltshire for a short holiday with his son. With Spring just around the corner this is an attractive prospect to look forward to.

**CHUCK . . .** **. . . THE MUDDLE ENGINEER**



# MELODY and STEAM at Laurel Farm

*ANTHONY BEAUMONT visits a Norfolk village where the old tunes of the fairground play to silent engines*

A 98-key Marenghi organ unique in Britain; *Victory*, *King Edward VII*, *Unity*, *Alexandria*, *Fearless*, an octogenarian centre engine, ranks of rollers, talk of showland history: all these, and much more, I found at Thursford in the rural heart of my own Norfolk.

Through the kindness of Mr "Jack" Palmer, steam traction engineer of West Dereham, I was introduced to Mr G. Cushing, the owner of a paradise of melody and steam.

Broadcasts and regular Sunday recitals have made Mr Cushing's magnificent organ widely known. It was built in Paris in 1905 and was recently brought to England, for the first time, from the Bellevue Amusement Park, Belfast.

With a predominance of large "church" pipes and a softened quality to the brass section, this special orchestral organ is of the "paper" type, and can handle classical, traditional and modern pieces with equal ease. For many years it travelled the Continent with bioscope shows. During the war it found refuge in Paris, where it was overhauled by the makers.

It measures 25 ft × 27 ft high and the topmost finials cannot be added, although the truck wheels have been sunk into the concrete of the special engine house. Finished in white and pink (formerly gold) with four large figure panels in natural colours, and with a large central carved group and brazen lions at the base, the illuminated front presents a wonderful spectacle.

Mr Cushing has lavished great care on the proper tuning and overhaul of the instrument. A new electric blower has replaced the worn bellows mechanism, all electrics have been re-wired, and oil heating has been installed in the building to maintain a suitable temperature and humidity.

The playing is now perfect. In my opinion, it surpasses the performance of the Hooghuys organ in the Belgian Carrousel Becquart, recorded by Decca. Some 40 pieces provide a varied repertoire, from "Blaze Away" to "My Fair Lady." Large audiences are easily accommodated in the building behind closed doors. With the doors open, the sound can carry for three miles.

Immaculate, near the organ, stands *Victory*, Burrell's first special scenic showman's locomotive, well-loved in these parts before the war. Its colour is the authentic deep crimson supplied by the makers of Burrell's paints, and the lining is gold leaf and black. With the original dynamo and exciter and the lifting crane tripod and polished copper chimney cap, the engine makes a perfect complement to the organ playing.

It is the 8 h.p. d.c.c. No 3827 of 1920, with three speeds and 8½ in. flywheel rim. Nothing has been over-

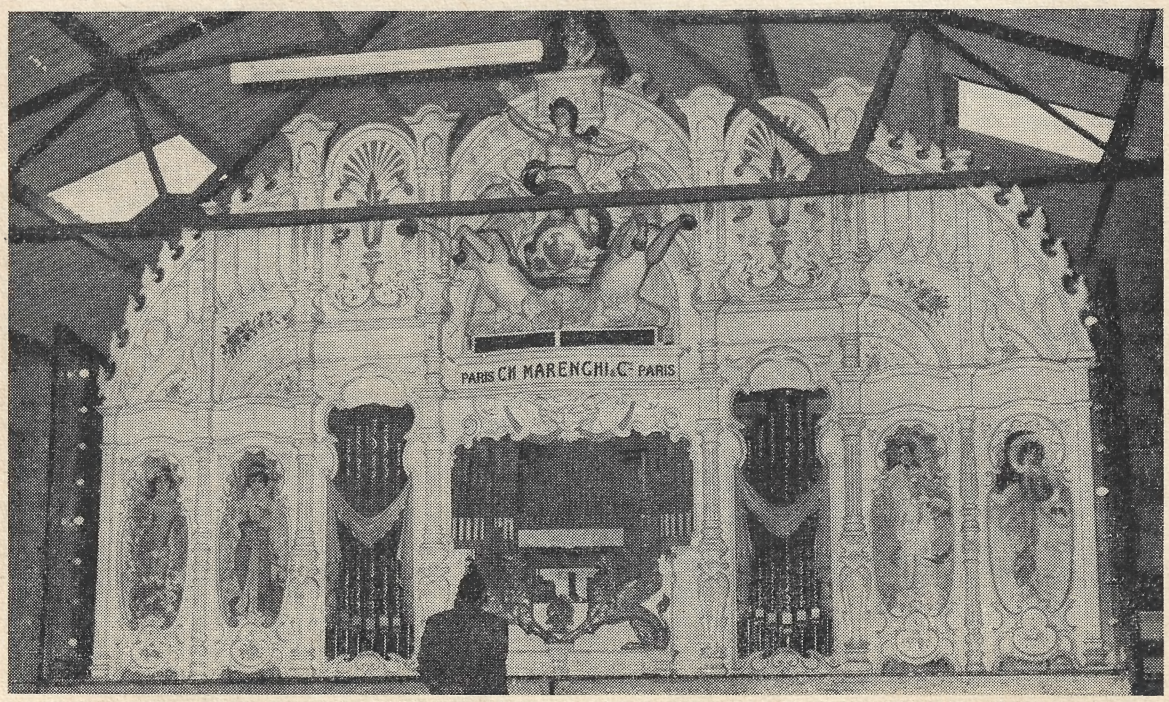
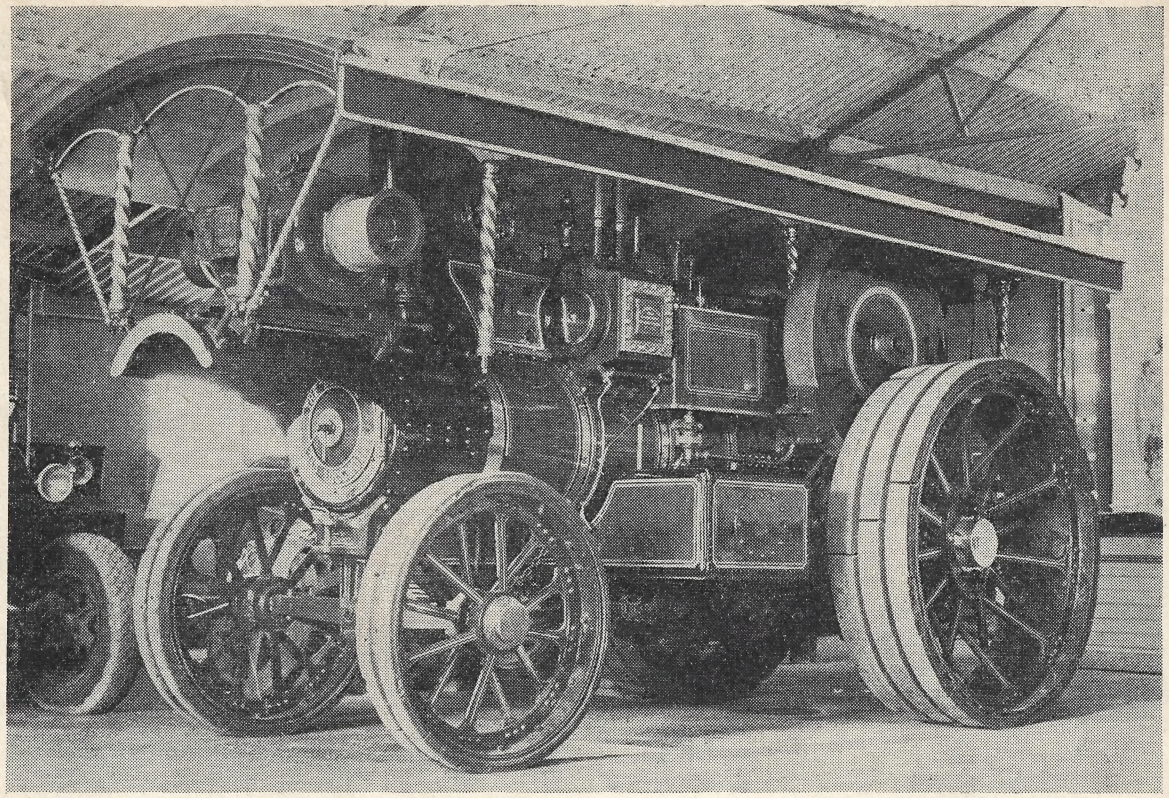



*Photo. courtesy of P. Doubleday, Fakenham*

*Built seven years before Bernard Shaw wrote* Pygmalion, *this Marenghi organ has survived to play the tunes from* My Fair Lady



*Burrell showman's road locomotive No* 3827, *special scenic, built in* 1920

finished, and the wheel spoke rivets are not picked out in a variety of colours !

Nestling up to *Victory's* dynamo platform is a fine Foden chain drive tractor of 1932, next in line to a Garrett 4 h.p. showman's tractor in course of restoration—*Medina* No 33902, of 1920. I saw the heavy cast-brass ornamental cylinder covers, richly engraved with floral designs at Garretts.

**In fine fettle**

Next in the parade comes *Fearless* the 7 h.p. s.c. Burrell, which was the last made entirely at Thetford in 1928 (No 4081). We move on to another traction engine—Ruston Proctor 8 h.p., No 39872 s.c., 1910.

Both these engines were illustrated in the ME reports of Woodton rally in 1959 and 1960. They are in fine condition.

At the end of the building stands a small Savage centre engine with organ engine, No 421 of 1881. It has unusual polished copper boiler lagging, and the position of the uptake has been altered at some time from the original design, probably to accommodate the organ engine over the smokebox.

This duplex cylindered engine contains some very fine and small work in the motion and organ engine. The valve chest is central, with no cover, and it seems likely that the whole cylinder block must come away for access to the valves. Years of polishing have well-rounded all the hexagonal brass fittings and gland nuts.

A small showman's living van has an interior dark and rich with solid mahogany and with the gleam of the cut glass panels and the tiled fireplace.

**Street piano**

The last engine is an Aveling and Porter roller of 1932, partly dismantled for restoration. It is the last made at the Rochester Works. The motion and gears were finished-turned all over, and the motion was polished.

To conclude on a musical note, a little street piano is tucked away between the engines. It bears the nameplate of one who did much for the street piano—Canon Wintle of Lawshall, Suffolk.

Outside the engine house stands a titanic Burrell showman's *King Edward VII* of 1905, No 2780. It is rated at 8 h.p. and, with rear wheels of 7 ft and front of nearly 5 ft dia., may be the largest Burrell in existence. The centre line of the motion is 4½ in. higher than usual, to accommodate the massive crankshaft balance weights.

**Fast mover**

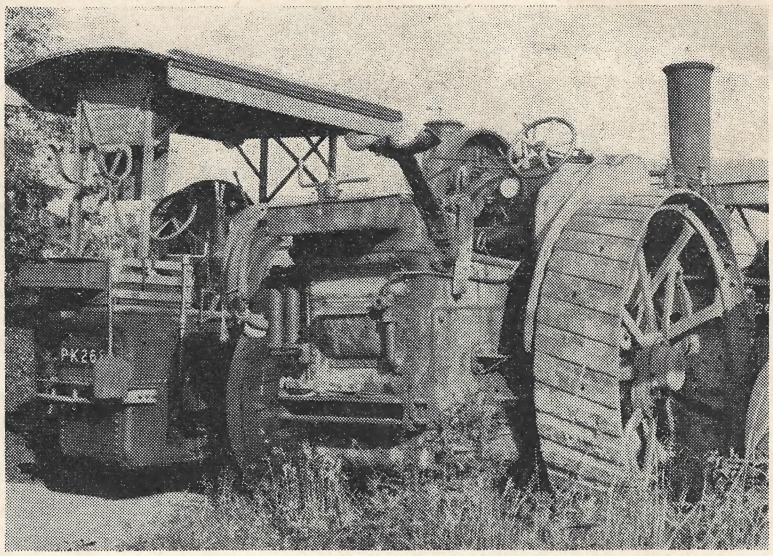
After the King Edward had been turned out as an ordinary scenic, but Burrell's fitted a longer smokebox and exciter, probably in the early Twenties. She was first used by J. Thurston to haul and power the "Royal Show" (bioscope) and the "Great Show." Later she passed to Presland. It is said that 20 m.p.h. could be reached on the road; *King Edward* was known over a very wide area.

When two special scenics were powering such rides as Dragons, Peacocks, or Whales, the smokeboxes glowed dull red and drivers "could not get across the road for a drink" because of the constant attention needed in generating for the heavy

demands. I clearly recall, at Lynn Mart when I was seven, the drivers in shiny peaked caps rocking with their engines, oil cans constantly in hand as they sweated under the coloured lights of the canopies, while overhead a pall of illuminated smoke drifted slowly into the misty February night.

A few yards away is a battalion of rollers tightly packed round another Burrell showman's, the ex-Thurston *Unity*, No 3200, 1910, 8 h.p., two-speed ordinary scenic. This helps us to answer the question: "What happened to Thurston's engines?"

Laurel Farm also has Aveling and Porter rollers. Two are from the Edison Plant Company, Grantham, and near them is the partner of Fowler BB ploughing engine No 15334 of 1916, illustrated in the 1960 Woodton report.



*Left to right: A and P tractor No* 12186, *A and P traction engine No* 9149

**Five rollers working**

In all there are 27 engines here, including seven in the engine house. At the time of my visit a further five rollers were away working. They were a Burrell gold medal convertible tractor, a Marshall S type, and three A and Ps.

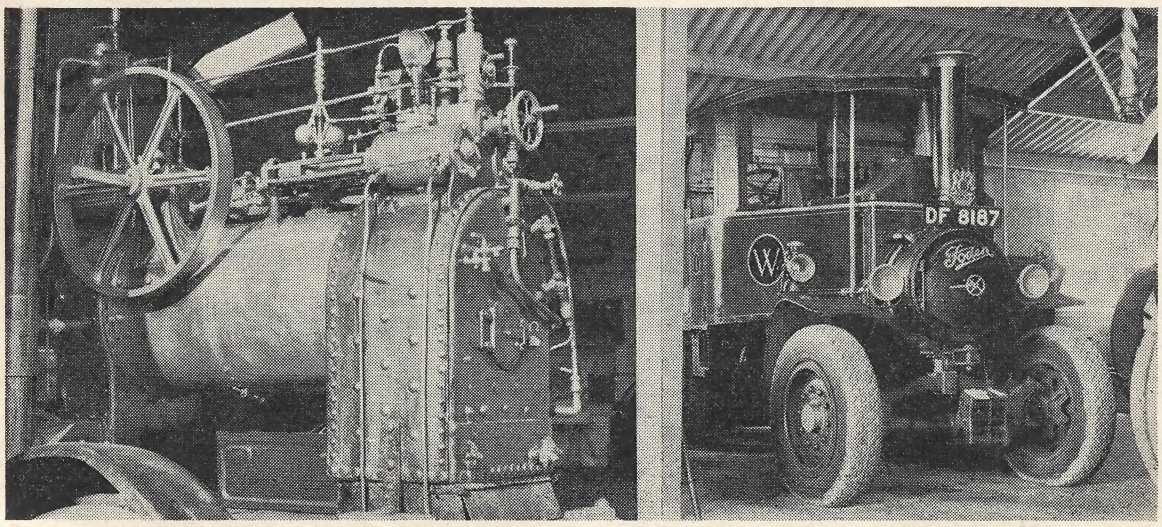
In the edge of a wood about two miles away we find another collection of Mr Cushing's engines. A few are far gone and half-concealed by young trees. The Clayton Wagon T1196 from Norwich Corporation has ball-bearing crankshaft to the double high pressure engine and Ackerman steering.

Burrell showman's No 3075, although nameless and in rather poor shape, would seem to be *Alexandria*, built in 1911; its dynamo is under cover nearby. In a shed is a Clayton tractor with iron shod wood wheels. Odd roller wheels stand against trees, and in the evening hush it is a little sad to see the engines which may never steam again.

The total of all engines must be 40, which may now be the largest number under single ownership. Here, for the enthusiast, is something more interesting in many ways than any rally.

My account has been made possible by the great kindness and hospitality of Mr and Mrs Cushing and their sons, who gave me every facility for gathering information, often late into the night, after their long working day.

I hope that every future visitor will see the little St John Ambulance box in the engine house, because there is no charge for the pleasures of Thursford. ▣

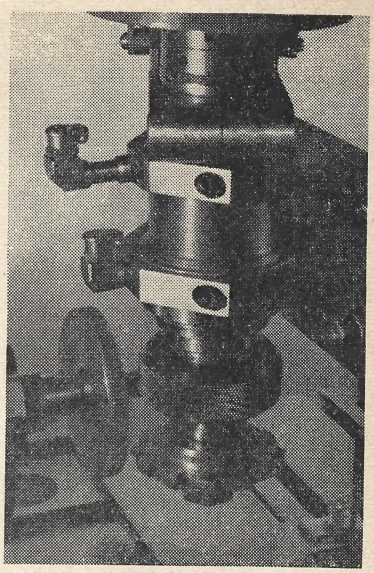



*Left: Savage small centre and organ engine No* 421 *is* 80 *this year. Right: Foden D tractor of* 1932

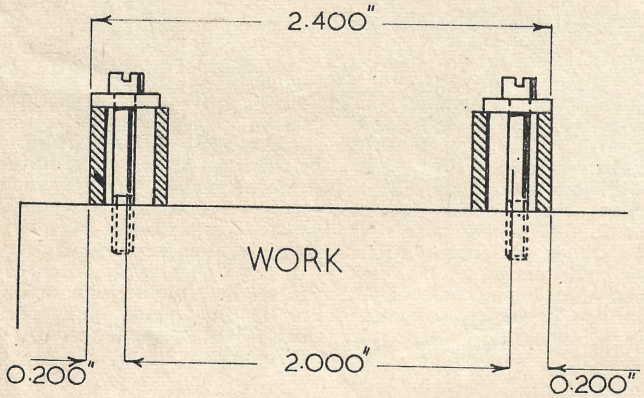
# Toolmakers' buttons need not be a mystery

**says IAN BRADLEY in his concluding article**

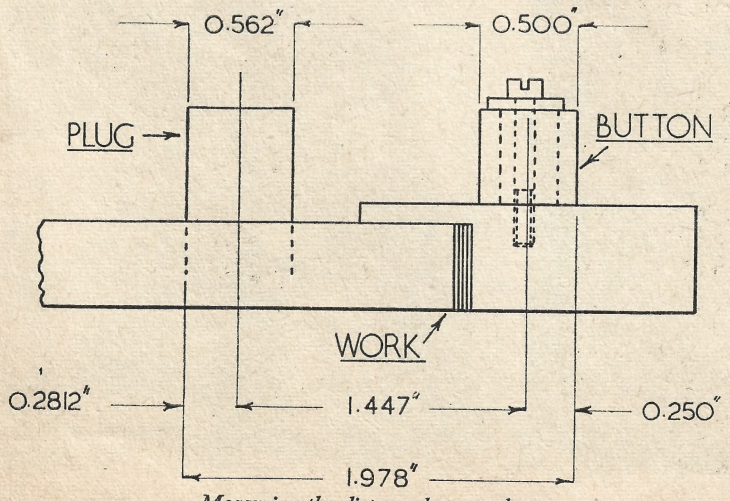
*Continued from 26 January 1961, pages 97, 98 and 99*



*Here the teeth are being cut in the toolpost spindle gear*




*Setting up a pair of buttons*




*Measuring the distance between buttons*

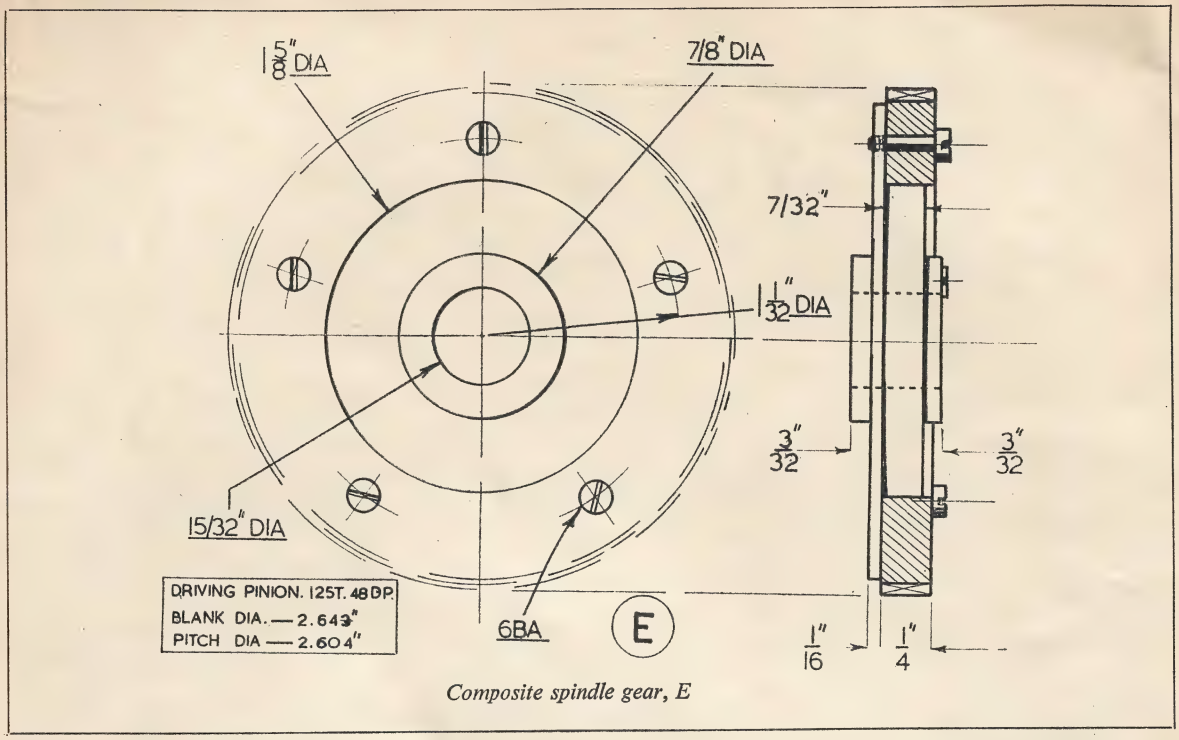
I HAVE mentioned tool-makers' buttons as the means by which the gear centres of the attachment may be established. To some the use of these devices is a mystery.

The buttons are steel cylinders, usually $\frac{1}{2}$ in. long and 0.300, 0.400 or 0.500 in. dia. A set consists of three buttons $\frac{1}{2}$ in. long and a fourth whose length is $\frac{5}{8}$ in. The longer button is used with one of the shorter ones when they are so close together that two of the short ones would interfere with the employment of a dial test indicator.

All are cylindrically ground to close limits, with their ends square to their axis. They are hollow so that they can be fastened to the machined face of a component by a screw. There is ample clearance between the fixing screw and the inside of the button; this enables the device to be moved about within the limits on the surface of the work and locked in the desired position.

**Ensuring accuracy**

Let us suppose that we wish to bore two holes $\frac{1}{2}$ in. dia. exactly 2 in. apart. We must first mark out the work and prick the centres ready for drilling and tapping, so that the screws holding the buttons can be roughly positioned in the work. In pricking out centres it is usually possible to get an accuracy of plus or minus 0.010 in. But it will be clear that an accuracy of this order would scarcely satisfy the requirements of gear meshing.

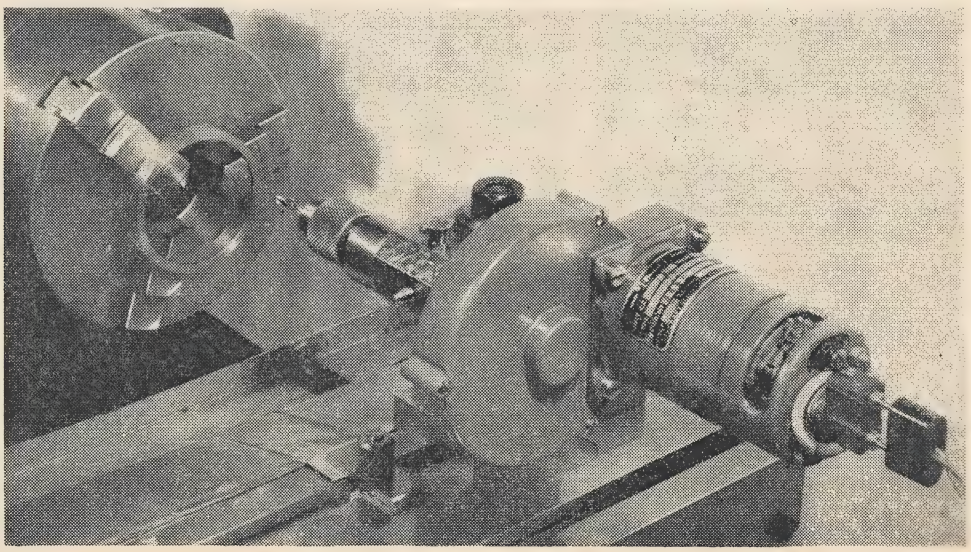



*Composite spindle gear, E*

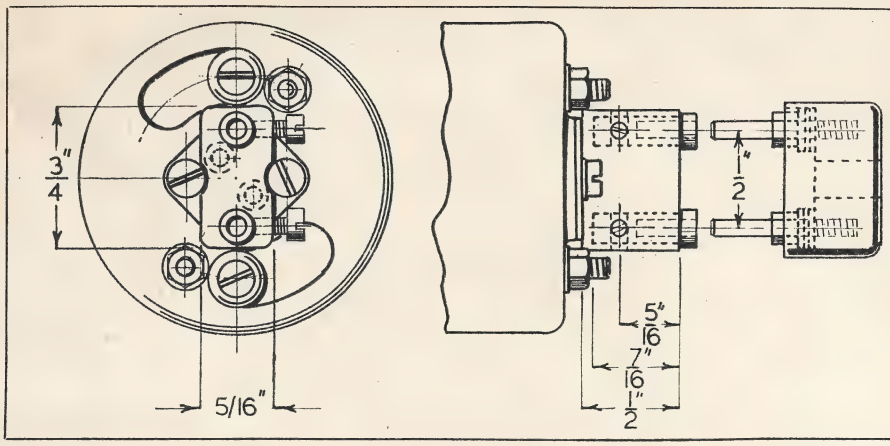
Accordingly, a pair of buttons is placed on the work with centres the needed distance apart. The work is transferred to the lathe faceplate, and one of the buttons is set to run true with the aid of a dial test indicator. Then the button is removed and the tapped hole is enlarged and finally bored to the required diameter. At the end of this operation the second button, in turn, is set to run true; after which the same procedure can be used to finish the second ½ in. dia. hole.

There are several methods by which the accurate measurements for setting the buttons may be made. The diagram, (page 162) shows the pair of buttons to be set up with their centres exactly 2 in. apart. If the buttons are 0.400 in. dia., they will be accurately spaced when a micrometer measurement taken over them reads 2.400 in. The measuring may equally well be taken between them, either with a vernier calliper or by slip gauges. It is then 2.000 in.—0.400 in.=1.600 in.

You will see that I have ignored any reference face on the work itself. If there is such a face, and if the first



*Spotting drilling centres for the attachment screw*




*Arrangement of plug-and-socket connector*

hole to be bored has not already been machined from the marking out, you will have to place the first button in relation to this reference or datum face.

Slips, vernier callipers, or even ordinary callipers accurately set, will serve to place the button in the correct position. The measurements are best made with the work fixed to an angle plate on the surface table. If the reference face of the work makes contact with the surface of the table, any measurement may be made between this surface and the periphery of the button.

In using the buttoning method of setting centres, it does not follow that the buttons must be of equal dia.; nor indeed do they need to have a ground finish. They will serve, provided that they are turned accurately, are well finished, and have their abutment faces—or at least one abutment face—square to the axis.

To set the gear a $\frac{5}{16}$ in. dia. reference hole has already been bored through both halves of the gear case, and so, if we insert a well fitting plug in this hole, we have a ready-made button in position. It will then be necessary only to set up a suitable button, say $\frac{1}{2}$ in. dia., on the motor platform and to adjust it at the correct distance from the first button. The drawing shows diagrammatically the manner in which the required measurement is obtained.

### Pitch centres

It may be some advantage to understand how the distance between a pair of gears is calculated. It is found by adding half the pitch circle diameter of one gear to half the pitch circle diameter of the other. In this instance we are dealing with two gears, both of 48 diametral pitch, one with 125 teeth and the other with 14. Their pitch circle diameters are given by dividing the number of teeth in each gear by its diametral pitch. Thus the pitch circle diameter of the larger gear is $\frac{125}{48}$ or 2.604 in. and that of the small gear $\frac{14}{48}$ or 0.291 in.

And so the distance between the gears is:

$$\frac{2.604 + 0.291}{2} \text{ in.} = 1.447 \text{ in.}$$

This distance is established by taking measurements over the $\frac{9}{16}$ in. dia. plug and the $\frac{1}{2}$ in. plug set up on the motor platform. The $\frac{1}{2}$ in. one is adjusted until a measurement is 1.447 in. plus half the diameter of the $\frac{9}{16}$ in. plug and half the diameter of the $\frac{1}{2}$ in. button:

$$1.447 \text{ in.} + \frac{0.5625 \text{ in.}}{2} + \frac{0.500 \text{ in.}}{2}$$

$$= 1.447 \text{ in.} + 0.2812 \text{ in.} + 0.250 \text{ in}$$

$$= 1.978 \text{ in.}$$

If a small square is now clamped to the work with its blade in contact with the $\frac{1}{2}$ in. button, the button may be moved sideways without altering the gear centres until it is in the centre of the motor platform. Here the measurement taken from the edge of the motor platform is:

$$\frac{1.750 \text{ in. (width of platform)} - 0.500 \text{ in.}}{2}$$

$$\text{(dia. of the button)} = \frac{1.250}{2}$$

$$= 0.625 \text{ in.}$$

When this position has been established, the button may be locked in place and the work set up on the lathe faceplate, so that the two parts of the gearcase may be machined together to produce the $\frac{1}{2}$ in. dia. tunnel for the motor pinion as well as the seating for the motor itself.

To maintain a reasonable degree of silence in operation, the gear ring is machined from plastic impregnated fabric. It is attached by five 6 BA screws to a light alloy blank machined to fit the appropriate seating on the drilling spindle. The accurate machining of the blank is of great importance and should be carried out on an arbor. The work is left in the chuck until all operations are complete; this, of course, includes the actual gear-cutting.

The plastic gear blank itself is first rough machined and left oversize. It is then mounted on the light alloy blank, set on the turned arbor and machined to drawing size.

In the particular motor used for this drilling attachment, the driving pinion fitted to the armature shaft is at a considerable distance from the shaft bearing. For this reason I thought it desirable to fit an additional bearing outboard from the pinion and in the lower half of the gear case. In order to engage this ball race the special nut securing the pinion was first rough-turned to give an extension from its hexagon part. This cylindrical portion was left some 0.010 in. oversize and the nut was placed on the motor spindle and tightened up firmly. The motor was then connected to an appropriate electrical supply, and supported by the self-centring chuck and the fixed steady in the lathe. This enabled the nut extension to be machined in position, the motor providing the power for turning the work to the correct size.

The driving motor has been provided with a plug-and-socket connector for the drilling spindle to be brought quickly into use. Details of the connector are to be seen above. The specially-made socket is attached to a plate forming the cover for the commutator-end bearing of the motor; the plug is a commercial component.

In use the drilling spindle may normally be connected to the low voltage control panel in the workshop. The panel has a rheostat in series with its output terminals, and so the motor speed may be varied to suit the work. ▣

# FITTINGS FOR SMALL LATHES

*By GEOMETER*

MAKING a lathe more convenient to use, or more precise in operation, is a process that most owners pursue, more or less, persistently through the years, according to their inclinations or the work which they have in hand.

No lathe maker, of course, can foresee every individual circumstance of use. A cheap lathe cannot include all the refinements, and consequently there is usually scope for modifications and additions, as solutions to specific problems, or simply in anticipation of future needs.

On a small lathe, it is often possible to speed tailstock clamping by modifying the arrangement and substituting a handle for a nut—which can be a considerable convenience in routine operations like centring and drilling, when the tailstock may have to be brought up and moved away immediately afterwards.

Where the clamping is by a plate and nut on the far side of the tailstock, a handle can be fitted, *A*, to work like the one on a production lathe. A new plate may be needed to carry the gib piece or guide which bears on the bed, and two reaction screws *X*-*Y* can be fitted in place of one. They are tapped into the plate and fitted with locknuts, and their ends bear in dimples drilled in the tailstock body. Through them, minor adjustments are made to keep the handle in a good clamping position, and the rear one, *X*, acts as a stop for the handle when it is loosened back.

The handle itself can be plain rod, or turned taper from the solid with a ball end, and then brazed or welded to a boss which is tapped for the main stud. Here a Whitworth thread gives extra axial movement for clamping and freeing, compared with a finer BSF thread—although the BSF may be used for the end of the stud in the tailstock. Initial major setting of the handle is done by facing the boss, and the final setting through the reaction screws.

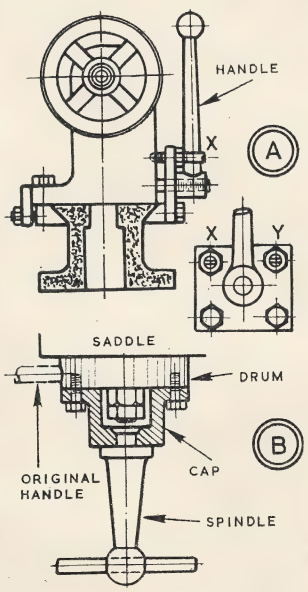
On a small lathe, where the bed is near to the chip tray, easy operation of the handle for the clasp nut to the leading screw is sometimes obstructed. This can be a drawback in screwcutting, and can cause delay whenever the saddle is to be positively located for facing operations. However, an extension, *B*, on the drum for the clasp nut permits operation outside the chip tray.

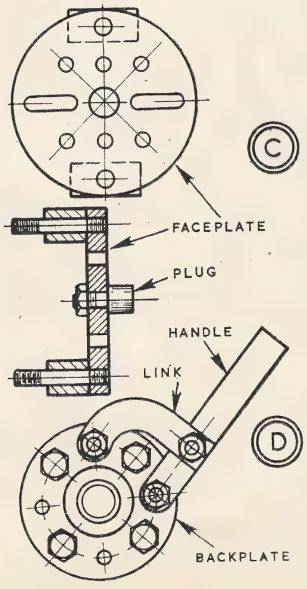
To reduce work on the fitting, the cap and the spindle are machined separately, the spindle having a stem to rivet or screw to the cap. Then they are brazed together inside the cap, cleaned up, and polished. The original handle is removed, and the ball end of the spindle drilled for the substitute to come conveniently into one's hand—fingers over the spindle.

For very small work, an auxiliary faceplate has advantages over the one supplied with a lathe because small work needs to be placed where the end of the spindle comes in the normal faceplate. It is true that one can sometimes overcome the difficulty by mounting the work on a piece of parallel plate and clamping this to the faceplate. But the convenience is not comparable to that offered by an auxiliary faceplate, *C*, mounted on the regular one. With access to the back, nuts can be fitted to the bolts of small clamps, while a screwed fitting can be directly held by a nut.

A disc or square of plate about ¼ in. thick can be secured by studs or countersunk screws (to keep the working face clear of bolt heads), the studs or screws passing through parallel distance pieces. Set up, the plate can be faced true, and reference marks made for future fitting. A circular plate can be trued concentrically from the outside, while a removable plug will serve the same purpose in a square one.

Loosening tight chucks is a problem that can be solved in various ways. Back gear may be engaged and the drive pulled in reverse to bump a jaw to a block on the bed. Alternatively, the backplate can be drilled radially for a large pin spanner, *D*. ▣



*Continued from 26 January 1961, pages 104, 105 and 106*

# EVERYTHING HAPPENED!

**At the first steaming the track burst into flame, and then the engine ran away while children fled. But all ended well for A. R. L. MORISON and *Josie***

APPEARANCE will have to be sacrificed to efficiency; larger pipes and clacks, I hope, will solve the problem. The tender-to-engine feed hoses are of windscreen-wiper tubing, fitted in a U-shaped manner and they have proved amply flexible on curves. All four hoses are secured with 12 BA clips which are not unsightly and make for efficient coupling-up.

The tender is to LBSC's design with a few modifications, and again much work is involved in cutting the bogie frames, though I happened to have an end-mill of just the right size for the axle-slots. The sides and back of the tender were cut from a single piece of 20-gauge sheet and bent around a wooden former carefully made up to the inside shape of the tender. A little hammering was needed to shape the incurves of the top and front edges; I always used a piece of wood between hammer and metal, with the wood long enough to cover the bend.

Coal-floor, wall and tank-tops were folded up with integral lugs and soldered to the sloping backplate and front filling-in piece. A recessed passage was soldered through the water-bottom to receive the spirit feed-pipe. The spirit tank fills the coal space, its top roughly hammered toroidal to resemble a heap of coal. No coal-gate is fitted as I could not see a way of inserting or extracting the tank with a coal gate.

The fuel pipe leads from the main removable tank into an auxiliary tank below the soleplate, and the end of the pipe is submerged when the auxiliary tank is about half-full, thus cutting off the flow of fuel. This theory holds good only if the main tank is absolutely air-tight. My tank had a couple of pin-holes through the soldered seam which were not discovered until it had been tested under water with a few strokes from a cycle-pump. It is not a sufficient test to fill the tank with spirit and watch for leaks when it is inverted.

LBSC's tender pump I found rather small. I had no difficulty in fitting one of twice the capacity. It worked even better when I had also fitted a ring of packing to the plunger—probably my close sliding-fit was not as close as LBSC intended.

My first steam-up was exciting. It took place on a bright, clear, gusty day, and there were plenty of young people eager to help. The tanks were filled and the bearings liberally oiled; and a few strokes of the pump showed water half-way up the gauge-glass. There would be no more messing about with miniature funnels, dripping water out of a jug through the safety-valve bush; this was going to be real live steaming.

A match was applied to the wicks. About half of them lit up after competing with the wind, and in a few minutes things were getting hot. It is difficult to see a spirit-flame in bright sunlight, and burnt fingers made me aware that the wind was blowing the flames outside the firebox. We quickly cured the trouble by using a plank as a screen. After we had seen some movement on the pressure gauge, a half-turn of the blower valve rewarded us with a jet of steam out of the chimney.

On went the smokebox door; we found that we no longer needed the windscreen. The water in the gauge-glass entertained us with an Irish jig, and a frantic oscillation on the pump handle created similar antics in the water gauge. As the pressure slowly approached the 20 lb. mark, I tentatively opened the regulator a little and *Josie* jerked into life.

It was a jerk to a dead stop; the cylinders were cold. We ejected the water from them by pushing the engine up and down the line a couple of times with the regulator closed. Somebody pointed out that the beading on the cab was lifting, the melted solder leaving a beautiful silver line where the beading should have been. There was a pause in the steaming operations while we completed the de-soldering to remove the beading for later attention, and then a young helper asked whether the flames should be coming up like *that*. The track was engulfed in a sea of burning spirit.

After half-a-dozen of the biggest puffs I could muster, I rushed off to get a fire-extinguisher while my wife fled to the telephone. Three squirts of carbon-tetrachloride removed the need to dial 999.

There was a bit of a stink and a nasty mess, and the tender wheels kept rusting-up for weeks afterwards. But we re-wicked the lamp and had another go, putting the spirit tank on one side for further investigation and using instead a lighter-fuel bottle—not with lighter fuel but with methylated spirit.

Again steam was brought up to 20 lb. and the condensate was evacuated. This time there was a healthy exhaust when the regulator was opened. So rapid was the acceleration that the engine leapt out of reach, and raced down the 40 ft track. Small children scattered in all directions as I chased the runaway, to grab the tender and shut off steam within a yard of the track-end.

I set the gear to reverse, and gingerly opened the regulator to allow a breath of steam to the cylinders. Away *Josie* went, back along the track at a more stately speed, with her retinue following. Suddenly I saw the regulator handle shoot wide open, and again we were all careering along after the runaway. This comedy was repeated until all the water had been used, and every time the regulator flipped itself wide open.

The test showed a useless water gauge, a faulty spirit tank, the need for pinning of soft solder near the firebox, and a queerly-acting regulator. We agreed that steam pressure was getting against the needle valve to blow the regulator open, and that there was no solution but to get the throttle out of the boiler.

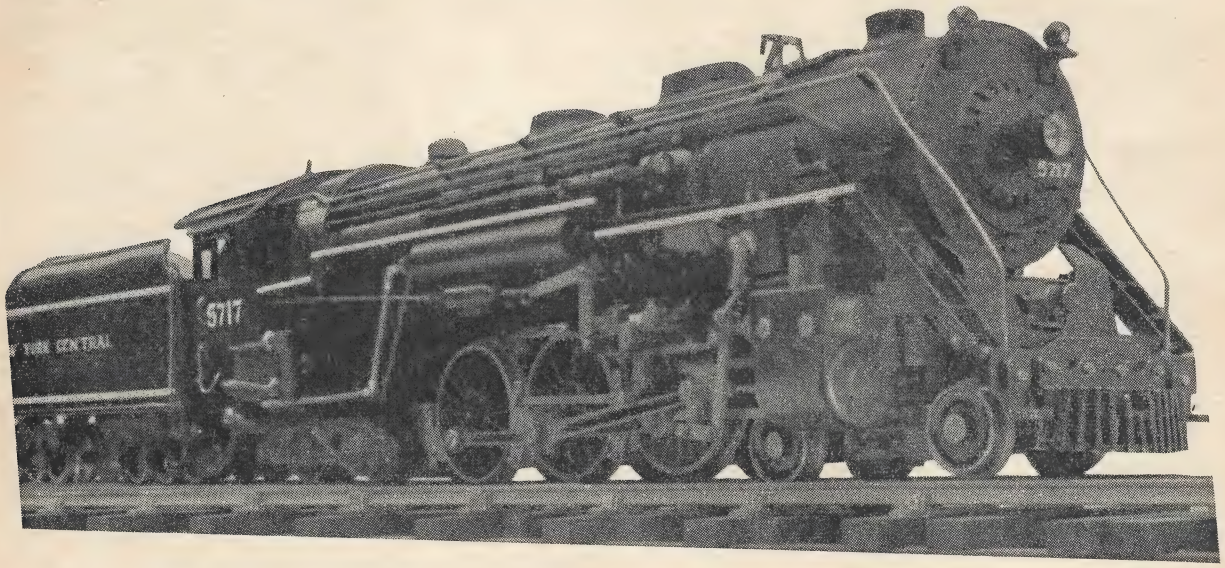
Having checked that we had followed the plans correctly, we decided that steam must be entering the front half of the throttle tube through some rather slack screw-

threads. We, therefore, made a new part with a longer and more accurate threaded portion, and used plenty of jointing compound in the reassembly. The regulator has since behaved itself.

A larger glass has been fitted to the water gauge but there has been no significant improvement, and I am convinced that I do not really need a water gauge. Perhaps at a later date I shall find room on the backhead to fit a water gauge to its own bushes, which seems to be the usual practice.

Later steaming showed that the spirit-lamp was not reliable. It would burn well for ten minutes or so and then flood or die out. Neither of these faults had any connection with the level of fuel in the auxiliary tank, and after some experimental alteration of the wicks I made a new burner. My first was based on a piece of $\frac{3}{4}$ in. $\times$ $\frac{1}{4}$ in. brass, drilled through feed holes to the eight wick tubes. The latest one, which works reasonably well, uses a piece of $\frac{1}{2}$ in. tube, the wall thinned down to about 1/64 in. and squeezed to a narrow oval approximately $\frac{3}{4}$ in. $\times$ $\frac{1}{4}$ in. It had to be annealed twice to prevent cracking during the squeezing. I also made the wick tubes of minimum thickness, silver-soldered on to the oval tube together with angle-bracket end-pieces and a lead-in tube. The asbestos wicks are firmly packed into the tubes and project less than $\frac{1}{4}$ in. I remove the smokebox door on lighting-up. Until there is steam for the blower, I help combustion by pumping gently with a cycle-pump from the bottom of the firebox. Combustion is very poor in these circumstances, and two ounces of cold water take five minutes to steam. But, with the smokebox door replaced and the blower going, a healthy yellow flame is induced along the boiler. Another five or six ounces of water is pumped in, and the pressure builds up to about 50 lb. in seven or eight minutes. This pressure has pulled a short train loaded to 30 lb. with ease, and I am prepared to believe that with 70 lb. *Josie* could pull a driver. But I despair of reaching 70 lb. with spirit firing.

Work on the decorations took a good deal of time and added to my scrap-box collection. One advantage of gauge O building is the reduced cost of scrapped material.




Running boards are fairly straightforward, but sturdy three-sided brackets were needed to give adequate support to the section fixed to the smokebox as the section carries an oil tank underneath and is subject to vibration from a link to the combination lever. The ladder-type steps were by no means easy to make. Eventually they were soft-soldered together without pinning; the soldering has proved adequate. Before assembly I squeezed the treads in the vice to impress a semblance of the diamond pattern usually found on them. The bottom of the steps is held by a $\frac{1}{16}$ in. rod through both of them, nutted each end, with a spacer piece between the steps bolted on to the pilot beam.

I built the cow-catcher pilot to LBSC's drawing, but from photographs which I have seen since I should say that a more realistic shape is desirable. It puzzles the meticulous that there is little relation between the height of the tender tow-hook and the pilot beam of the engine. I am sure that the engines worked in tandem sometimes, but I remain ignorant of the coupling method.

Dummy air tanks have been added under the centre sections of the running boards. The left-hand tank is solid and the other is a disguised whistle, which at the running pressure of 50 lb. is just beginning to sound like one, though when it was tested with a foot pump it was loud and clear.

Dummy duplex pumps have been made up for fitting under the ladders, and as they cover the displacement lubricator an easy method of detachment is necessary. The lubricator caps were, therefore, slotted and reduced to 7/32 in. dia., 7/32 in. holes were drilled in the back of the pump's upper sections, and a short bar was soldered end-on to the lower section to slip into the lubricator stand. After filing a clearance under the steps, the pumps are easily pulled off for replenishing the oil.

Lagging covers for the cylinders were bent up to a tight push fit over the castings, the union and first bend of the dummy oil pipes being fixed to the top and other bits and blobs soldered in Small steel blocks were shaped to the oil tank outline and secured to the running-board by two 12 BA bolts in imitation of the oil-filler caps. A double link was mounted to oscillate on a pin fixed to the centre of the tank and was driven from the top of the combination-lever,

lengthened by $\frac{1}{8}$ in. to accommodate the extra pin.

The handrails were offset to clear the turret-shroud, and this made fitting and removal as one piece nearly impossible. Eventually each handrail was made in three pieces, with the junction concealed by drilling a No 70 hole up one piece and turning down the adjacent piece to fit into it I used 3/64 in. rod and did the drilling in the lathe before bending, holding the drill in a pin chuck which itself was held in the tailstock chuck. The drill point will start a fairly true centre provided that a short length only is protruding from the chuck.

There is also the watchmaker's way of using a diamond-shaped graver held firmly on a hand rest, the sharp point cutting an accurately centred dimple for starting the drill. It is an exaggeration to compare O gauge live-steam work to watchmaking. Picking up a centre like this was my nearest approach to watch-repairing technique, and anybody who has dabbled with pallets, hairsprings and balance-staffs will appreciate that 12 BA sizes are coarse in comparison.

The curved cover plate over the top of the smokebox is fixed by four 12 BA bolts with 14 BA heads, the remaining hexagon heads being dummy bolts. In full size the cover plate gives access to the regulator for installation and servicing, with control from the cab by an outside rod running along above the handrail. On the model it was not difficult to connect the rod with a piece of bent brass to the regulator handle inside the cab so that operating the regulator also moved the crank on the smokebox.

Despite many attempts I did not succeed in making a good bell-frame out of $\frac{1}{16}$ in. brass rod as recommended. Finally I cut a frame out of a scrap of 3/32 in. plate; in steel it was certainly more rigid. A 10 BA securing screw with oversize head passed through the smokebox outer casing and boiler and was concealed by the bell fitted afterwards.

The brake-gear on the wheels was copied from photographs, with the hangers pendant to the top of the frames from well-fitting bolts. All are connected by long 30-gauge springs to each other and forward to a stretcher between the front of the frames. The blocks are held lightly in contact with the tyres and create no appreciable loss of power.

Frame and wheels were painted very early during the construction, and the boiler and superstructure were stripped down to individual parts for painting. Smokebox, domes, pipes and tender top are painted dull black and the remainder have a glossy Japlac finish. The Japlac tended to get tacky on the first few runs until it was baked on, and I found that gentle rubbing with an oil-soaked rag when it was hot gave a more subdued gloss, very workmanlike and durable. With handling the dull black paint tends to rub off the edges.

For the white lining on the tender I used Selotape as masking after the black paint had been baked in the gas oven, and strips of Selotape as borders between which the lettering was applied with a fine sable brush. A second fine brush was kept moistened with turpentine for erasures, and was used to produce the bars for stencilling as each letter was finished. The numbers on cab and tender were made with a stencil cut out of Fablon and were a little oversize. I could not make a usable stencil for the lettering.

The engine has now done 30 hours of steaming and the valve-gear pins are very much slacker than when they were first fitted; I have concluded that case-hardening when they are first made is probably worthwhile. Signs of heat are seen on the white lining near the firebox, and the trailing brake hanger has acquired a deep straw colour. The rods and other bright parts are wiped over with oil after each run, and pointed matchsticks are used to clear the mixture of dust and oil from the less accessible parts of the valve-gear. Oil is often found on the wheel treads, but it has not caused slipping; no doubt it would be troublesome if loads near the maximum were hauled. There is no trouble in running on curves of 6 ft radius, and I estimate that a 4 ft radius is the minimum curve that *Josie* can be expected to clear.

For the railway enthusiast who wants realism in his electrical layout, steam locomotives are a practical proposition, though the effects may not be so welcome. Dust and oils are an unfortunate corollary of full-size steam practice which cannot be tolerated in operating electrical circuits. The purist would frown at the lack of control and the loose scaling-ratios and would firmly disapprove of real water and oil around the track, despite their realism ! It has occurred to me that some simple pot-boiler controlled by a valve operated through the dummy rods might provide the puffs of steam without which the most elaborate electrical set remains unreal.

[In America the models are often made to puff smoke.—EDITOR.]

The pleasure of producing power on wheels has its own fascination, amply fulfilled in making a steamer for O gauge. The cost, considered in terms of a weekly outlay over the longish period of construction, is negligible, and the joy of seeing your own product scampering down the line under its own power is beyond my description. You may wail loudly at pumps which refuse to work, gauges which tell lies, and fires which will not draw—but that is for the benefit of the onlooker. You will go to sleep of nights thinking out possible solutions for tomorrow. ▣

## DIAGONAL GAS ENGINE

IN 1923 or thereabouts I had a Robinson gas engine. I was a very raw first-year apprentice and the engine was rather old and tired. This was not surprising as it had spent many years turning a large potato cleaning appliance of 3 cwt capacity in the local fish and chip shop.

On a steady heavy load, where the engine could almost choose its own speed, it performed well. It had some clever features but was simple almost to the point of crudity.

It was a splendid example of the art of producing cored castings, the bedplate cylinder, bearings and cooling system being contained in one monobloc casting. The hopper might, with advantage, have been taller, as it required frequent re-filling. By putting the cylinder at an angle the hottest end received the coolest water.

The valves were excellent in theory but not so in practice. The inlet valve consisted of a round block of cast iron with a central hole for the valve stem, the head of which was a flat plate. There was a ring of holes of $\frac{1}{4}$ in. or so dia. around this.

They were, from memory, about ten in number, nine of which went through, the tenth being a blind hole. Into this a gas pipe was led and controlled by an ordinary domestic gas cock.

The inlet was by suction only and the choice of spring was very critical. The exhaust was operated by an eccentric which carried an adjustable tappet rod, the idea being that the valve had a period of " dwell " as the eccentric came up to and over dead centre. The eccentric was guided(?) by a projecting lug with a hole in it through which ran a $\frac{3}{8}$ in. rod.

I tried to drive a round bed Drummond lathe with it, and had the gas cock fixed on the lathe stand. In the absence of any form of governor, the operative word was " drive."

It is not surprising that I returned to driving by treadle until a supply of mains current was laid on in the village !

H. H. WARD

# SS CANBERRA MODEL COMPETITION

**This is a great new competition for ship modellers—jointly sponsored by the P & O Steam Navigation Co. Ltd. and MODEL ENGINEER. Silver cups are to be awarded for what are judged to be the best models of the new P & O liner, s.s. CANBERRA, which will be sailing on her maiden voyage this year.**

In conjunction with the competition there is a series of articles describing how to build the Canberra—either a hull or waterline model. The first article was on August 25 and fortnightly instalments continued until January 26.

The handsome silver cups, one for each of the three sections in the competition, will be presented by the P & O and medals for craftsmanship will also be given.

Two of the three classes are for boys—the first for youngsters under 15 and the second for boys who have reached 15 but are under 18. The third class is open to all ages and will no doubt appeal to many experienced and expert ship modellers.

Joint efforts are allowed but where groups of boys build a model, the age of the oldest boy must be the determining factor as to which class is entered.

The latest date for the submission of completed entry forms is: 30 June 1961. Models must be completed by 31 July 1961.

It is intended that prize-winning models will be on show at the next MODEL ENGINEER National Models Exhibition. In any event there will be a display of some of the entries but details will be announced later.

Entry forms should be sent to the MODEL ENGINEER, 19-20 Noel Street, London, W1. Details of where the models should be sent will be notified direct to competitors nearer the closing date.

Any scale may be used to build the model and no limitations are made on the type which should be entered. The choice of materials is entirely up to the builder.

The series of special articles, written by Mr Edward Bowness, describes the liner, how to build at least two different types of model, and discusses the problems generally. The ME Queries Department will be prepared to answer questions from entrants provided that letters comply with the Query Service rules of MODEL ENGINEER. These are printed in each issue of the magazine.

## CONDITIONS OF ENTRY

1. The Competition is for a model of the P & O liner s.s. CANBERRA, a plan of which was issued with MODEL ENGINEER of 25 August 1960 and is organised by Percival Marshall and Co. Ltd.
2. There will be three classes:
   A—Aged under 15 on 31 July 1961.
   B—Aged under 18 on 31 July 1961.
   C—Aged 18 and over.
3. Any scale may be used. A waterline model is eligible. Materials are at the discretion of the competitor but their suitability may be borne in mind by the judges.
4. The closing date for the competition is 31 July 1961 and the latest time for the receipt of completed entry forms is 30 June 1961.
5. Models must be sent to an address in London by a date, probably in early August 1961, which will be notified direct to the competitor. While in transit the models are the responsibility of the competitor and Percival Marshall and Co. Ltd. accetp no responsibility for them. The prize-winning models and some of the entries will be placed on show at the discretion of the organisers, before being returned to competitors.
6. A joint or co-operative effort in model making will be allowed in the competition, although this fact must be clearly shown on the entry form and may be taken into consideration by the judges. Where co-operative efforts are entered, the age of the oldest model maker taking part must be used in determining in which class the model should be entered.
7. Expert judges will be appointed by the Editor of MODEL ENGINEER. Their decision shall be final.
8. A silver cup for each class is to be given by the P & O and medals for workmanship will be awarded by Percival Marshall and Co. Ltd. The awards will be at the discretion of the judges and they may not be made if the entries are not up to the standards expected.

## ENTRY FORM

Name.....

.....

Address.....

.....

.....

Date of birth if entered in classes A or B.....

.....

Class entered.....

Scale of model.....

Length of model in inches.....

State here if any parts of the model were purchased, and if so, what they were:

.....

.....

.....

.....

If the model was produced in collaboration with other modeller(s), give details:

.....

.....

.....

.....

Details of equipment and tools used:

.....

.....

.....

.....

Please give the names of two local or provincial newspapers in your locality:

.....

.....

I certify that the model is my own work, other than as stated above, and that I will abide by the conditions.

Signed.....

Date.....

Send this form to Model Engineer, 19-20 Noel Street, London W1. Details of where the model is to be sent will be sent direct to competitors.

CLOSING DATE FOR ENTRY FORMS: 30 June 1961.

Models to be completed by 31 July 1961.

Continued from 12 January 1961, pages 42 and 43

BLACK SAND

# NIGHT OF THE ZEPPELIN

## —and the morning after

*By GEORGE W. EVES*

DURING the next hour, I wrested with cores that seemed determined not to part company with the box, and I found that ramming was an art unto itself. My efforts were frustrating. Most of the cores refused to budge, and the others were cracked. When at last I got one out, it was soft and useless. And only a couple of feet from me, the doyen of all coremakers was producing frail looking $\frac{3}{8}$ in. dia. cores with consummate ease.

My association with Charles made the moulders curious, and it was not long before they were asking him all sorts of question. "How's the new mate getting on?" became monotonous. "Middlin'," Charles replied. "Just middlin'. Might make something of him, given time." When my old father looked in with the same question, Charles was a little more hopeful: "He'll be all right," did much to restore my sagging spirits. After dinner I suddenly seemed to get the hang of ramming hard cores and getting them out of the box whole.

The moulder nearest me wore the biggest pair of clogs I had ever seen. He was a happy soul and sang away at the top of his voice, always the same thing, the old Salvation Army favourite: "O that will be joyful." His nickname was "Tay-ters." But his shovel was reckoned to be the best one in the shop; it outshone even my mate's.

### The core oven

Later in the afternoon, I was shown the core oven. It was brick-built and closed by sliding steel doors, through which a lorry could have been driven. Round the walls were rows of iron shelves in tiers from floor to ceiling, and at the far end, in the floor, burned a coke fire which took three barrowfuls of fuel to build up. The heat was terrific, the fumes were choking, and you had to dash inside bending double, select the shelf, and hurriedly stand up to stow whatever you had to dry. With a plate 3 ft long full of green cores, this was not easy. If disaster overtook your endeavours, then you were termed: "bloody occard." When I complained of the heat and fumes, I was told that they were far better than any doctor's medicine for any cold, cough, or catarrh.

Charles and I shuttled to and fro with plate after plate of his masterpieces, while my own contributions, so small compared with his, were accorded a place of honour. With a long iron rod, my mate shook the dust from the fire and I piled on a barrowload of coke. I was coughing and spluttering.

Between us we slid the iron doors together. They were covered with chalk drawings. Whatever happened in the course of the day, or in the evening at one of the hostelries, next day would see it fully illustrated on the oven doors, to the delight of one and all, including the boss. Shutting up the oven was the symbol of the end of the working day, which began at 6 a.m. and finished exactly $11\frac{1}{2}$ hours later. All the men in the works lived in the village, except Charles. He could not abide village life. "Too many people poking their noses into each other's affairs," he would say. Every morning at dawn he got out his bicycle and coasted a full five miles from the top of the Downs into the valley, and every night he pushed his machine most of the way home uphill. to a dozen cottages and a pub, where he said, all was peace. He did this journey for years, through thunder storms and snowstorms, in daylight or by the glimmer of an oil lamp; all without a single fear.

Next morning, I was up betimes, like Pepys. Ten minutes later at 5.40, I took my brass tablet off the hook and placed it in the box provided. I was officially "on the board." I ambled through the various departments where men were lighting up flaring gas jets. The foundry was blacker than ever, and the gas lights made it just possible to avoid the pitfalls. The coremaker's corner was a bit better and when I had struggled into my overalls, Charles arrived, happy as a lark.

As soon as the foreman had disappeared, our corner became the meeting place for the moulders and those attached to the foundry. Rank old clay pipes were soon glowing, and look-outs were stationed to watch all approaches lest the man in the bowler hat should slip back, which he occasionally did. But the lookout system had all the finesse of Sandhurst training itself, and it was seldom caught napping.

### The morning gossip

And as I watched the backyard for intruders, I listened to the conversation. Then they say it is only women who talk! Not a thing escaped attention here—last night's band practive, the bell-ringers, what seeds were sown, and whose they were. . . . Politics were always good for a lengthy session, together with any scandal that might be going. Murders were top priority. The foundry foreman used to bring in the *Police Budget* whose pages were adorned with gruesome drawings.

Suddenly there would be a shout of "Tally-ho!" and everybody vanished. Charles hurled back the oven doors with a resounding clatter, entreating me to follow him. Hammers clanged loudly in the smithy, sheets of metal were seemingly hurled about in the boiler shop, and in mere seconds the place was in top gear. By the time that the foreman had entered the main door, the whole place was a scene of great activity.

Meanwhile Charles surveyed yesterday's work with a professional eye. The yellow cores were almost white, and as hard as concrete. Charles

showed me how a badly rammed effort powdered easily and would ruin the casting.

The fire was almost burnt out. My job was to restore it to normal. Meanwhile all the good cores were removed from the plates and stacked on the lower shelves. Then there was more sand to sift, not only for myself, but for my mate too. I damped it to the correct degree, and rubbed it thoroughly between my hands. Plates had to be prepared for today's work, the oven fire to be watched and damped back correctly, and the water pots to be kept filled.

Our half-hour break at eight o'clock for breakfast seemed all too short before we were plunged into the daily round, which to me was never dull. All sorts of traffic passed our corner. There were barrow loads of sand and coal dust for facing sand, the special sort which is rammed next to the pattern. Men were always fetching buckets of water, or mixing up containers of slurry, a creamy combination of clay and water, in which all hooks and irons used to strengthen the moulds were copiously covered. Moulding boxes were borne past, some small, some large.

**The engine room**

Outgoing traffic consisted largely of scrap iron, siftings and rubbish. All the time, Charles with one eye on me, and the other on his own work, rammed effortlessly away, putting three cores on his plate to one of mine, while "Tay-ters" sang the song which General Booth made famous. "Sand up, George," was the signal for me to stop core-making, grab shovel and barrow and the sieve of which I had now been granted the freedom, and make my way to the sand shed. I soon found another route, which took me past the engine room where the oil engine pounded away, keeping the lathes, drills and planers in motion.

It was a ponderous affair, painted a bright green, with a red big end. All else was highly polished. The bulb on the cylinder head was almost red-hot and the big Pickering slow speed governors did not rise at all. But despite its overload it thumped and plodded away unattended.

Near to it was a Ruston 8 h.p. portable. It was steamed when all machinery was working, and if the foreman found me watching enchantedly he called something different from "Sand up, George!"

Between whiles, I rammed away, attended to the oven fire, disposed of the ashes, and fetched buckets of water from the river at the bottom of the yard. The foreman had his garden there; he grew nothing much except some very fine apples. Although there were many apple and pear trees growing in the yard among the iron and the stacks of moulding boxes it was his apples which appealed to me.

Then there was the nightly ritual of taking the green cores into the oven, banking up the fire, closing the oven doors and cleaning the tools because one night's rust ruined them. When the works' bell announced to the village, as well as to ourselves, that it was half-past five, everybody had his jacket on and was making for the door. Sometimes the foreman, watching this exodus, would loudly declare: "None of you so-and-so are so anxious to get in at six in the morning."

**Strange noise**

That night a strange sound came from the air. Our old dog kept barking and my father went outside a time or two, but could not find the reason. Next minute a terrific explosion shook the house, rattling the windows and the crockery on the sideboard. Before we could rise, there was another, even louder. Three lesser ones followed. By now the house was in a high state of agitation. And so was the farmyard; dogs barked, chicken cackled, geese gobbled. "It's that blooming old Kaiser's Zepplins," said my aged aunt vehemently. Outside we listened to the roar of the four Maybach engines as they receded. The Zeppelin must have been pretty low, because I could hear the rattle of the chain-driven propellers.

Although nothing more was heard of the raider, nobody in the house, or in the village, went to bed. Thus it was a very tired boy who trailed into work next morning at a minute to six, "Just in time," wailed the foreman.

Ten minutes later word went round that one of the fitters had not arrived. Instantly everybody grabbed a short length of iron bar and stationed himself near something made of the same material—old boilers, fireboxes and sheets of steel. Charles took up his station before the oven doors. I gaped at the scene. Seconds later the cry: "Now!" echoed through the works. At once a hundred steel bars, or so it seemed, beat wildly on the metal in a deafening tattoo. Some of the men beat ponderously, others jangled away, and here and there some rattled tin cans with a steel nut in them. It was bedlam.

Even when the culprit sheepishly hung up his coat near his lathe, the din continued until at last only a solitary boom-boom came from the depths of the gas-lit smithy.

Late arrivals were "rattled in," because in those days a man who was late was deemed a lazy layabout, a term shunned by all the employees. The degradation and humiliation of "rattling in," hung over the unfortunate one for the rest of the day.

Needless to say, the din brought in the foreman, who roundly cursed all and sundry, with a special titbit for the cause of it all. But once the foreman had retired, the coremaker's bay became the meeting place for the smokers and the topic, of course, was Zeppelins and bombs. Charles, living on top of the hill, had seen the Zepp before the bombs were dropped. Moreover he knew where they fell. They were in an orchard, and I was not the only one to listen open-mouthed as he told how he and his farmer neighbour had quieted the alarmed horses, and then, taking lanterns, had located the craters. Charles's narrative reached a high peak when he said that you could have put a wagon in one of them. There were gasps and exclamations: "Where did it come from?" "Cuxhaven," I piped up; for I had seen a picture of a Zeppelin in my brother's *Aeroplane*.

The timely shot of "Tally-ho!" dispersed the meeting and saved me from wrath.

★ *To be continued*

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## WILL THE THOMPSON L1s BE SCRAPPED?

With the extension of the electrification system on the Great Eastern section I have been wondering what was to become of the Thompson L1 class 2-6-4Ts built as recently as 1945 and used on these lines. The answer seems to be scrap, for already one, No 67702, has been withdrawn and it is rumoured that another 20 made redundant by electrification will be following the same sad route.—R.O.

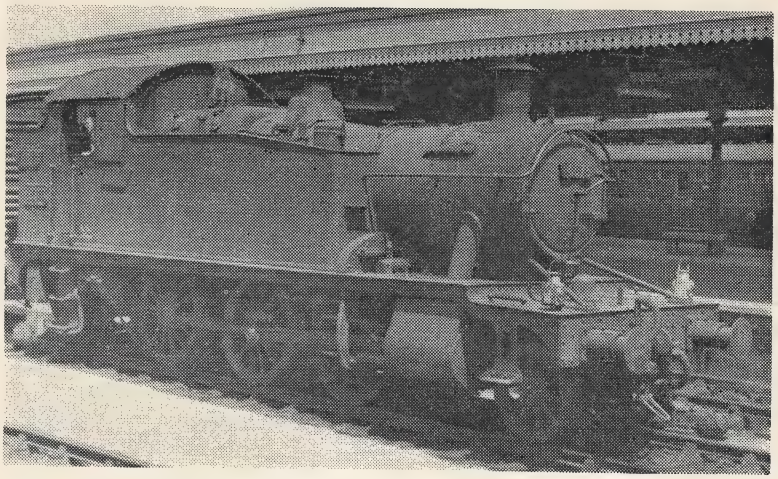
# THIS IS FIREFLY

*MARTIN EVANS introduces his new locomotive, a GWR 4500 class 2-6-2 tank engine which he will describe for 3½ in., 4¾ in. and 5 in. gauges*

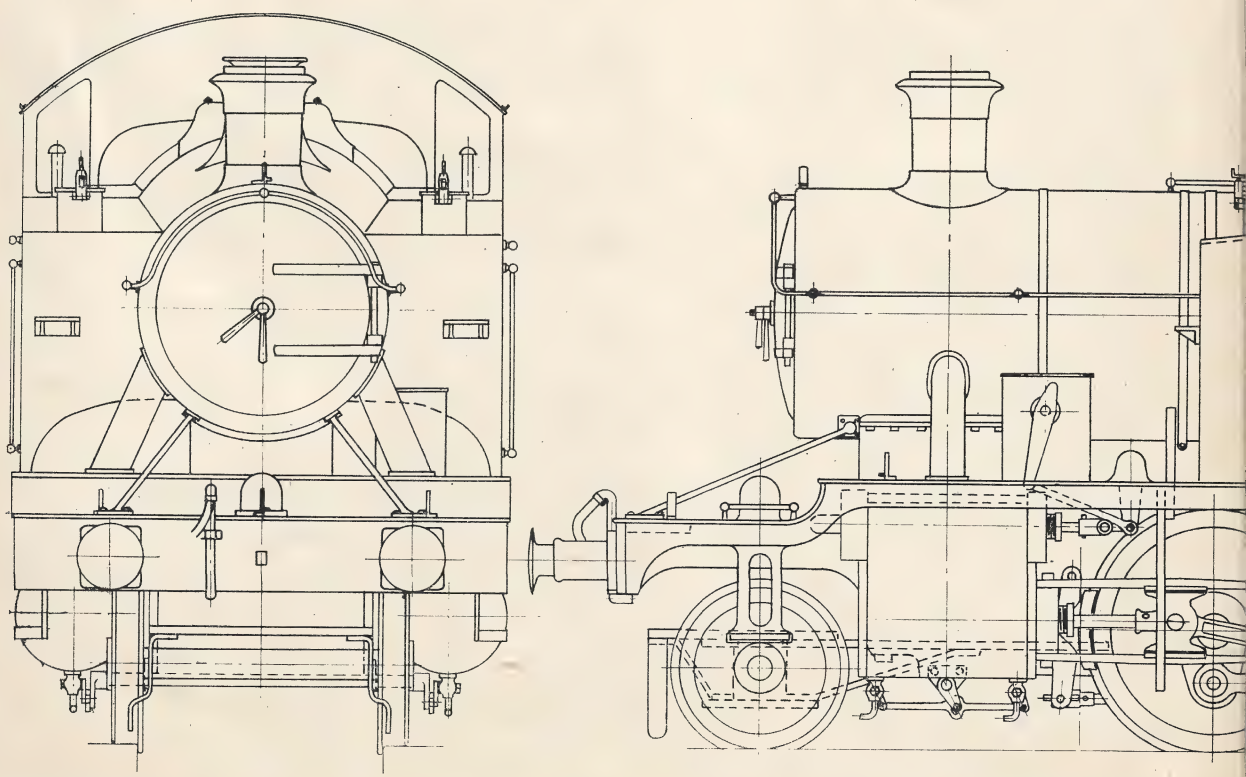
HERE we are at last—with our readers' choice—the Collett branch-line engine of the later series of 4500 class 2-6-2 tanks.

I am naming this little engine *Firefly*, after the class of that name designed by the great Sir Daniel Gooch. The Firefly class, which were, of course, broad gauge engines, were the first passenger engines to be designed by Gooch, and *Firefly* herself, with the 2-2-2 wheel arrangement, was built by Jones, Turner and Evans, of Newton, Lancashire, and delivered to the Great Western Railway on 12 March 1840. She had 7 ft dia. driving wheels, 4 ft dia. carrying wheels, 15 in. × 18 in. cylinders, 50 lb. working pressure, and 135 sq. ft grate area.

The name *Firefly* for the 4500 engines is not inappropriate; in spite of having



*Engine of Class* 4500 *on station pilot duty at Bristol Temple Meads, June* 1960



the driving and coupled wheels only 4 ft 7½ in. dia., the 4500s are quite speedy. I remember travelling very fast between Stratford-on-Avon and Leamington Spa a few years ago behind one of these small Prairies; the train had been delayed, and for the last few miles the driver, in an effort to make the connection on time, opened out the engine. Speed rose to well over 60 m.p.h., and the exhaust sounded much more like a powerful motor cycle than a locomotive !

Churchward originated the design of the 4500 class, Collett making only one or two minor modifications, such as the shape of the side tanks, to give larger water capacity. The first of the class appeared in 1906, and was intended for branch line work, mainly in Somerset, Devon and Cornwall. The cylinders, of the usual Churchward pattern cast in one with half of the saddle, were 17 in. × 24 in. stroke. The boiler pressure was at first 165 lb., but this was soon increased to 180.

Other unusual features were the shape of the boiler. Part of the barrel was parallel and part steeply tapered. The usual top-feeds were added later, together with a regulator collecting steam from the top front corner of the firebox.

The valve gear, too, was typical of Churchward practice: Stephenson's, with launch-type links and long valve travel. The links were centre-suspended, and the lead was ⅛ in. negative in full gear. Because of the short eccentric rods, the lead increased to $\frac{3}{16}$ in. positive in mid-gear, or about ⅛ in. positive lead at 25 per cent cut-off. The leading and trailing pony trucks, which had 3 ft 2 in. dia. wheels, were of the bar frame type built up from standard sections and fully compensated. (Churchward was one of the few British CMEs to adopt compensated driving and coupled wheels.) Both steam and hand brakes were fitted, in addition to vacuum brakes for working passenger trains, the air pump to maintain the vacuum being driven off the right-hand crosshead.

In 1913 a further series was built, beginning with No 4530, and in this series the boiler working pressure was increased to 200 lb. As the earlier engines came in for new boilers they, too, received the higher working pressure.

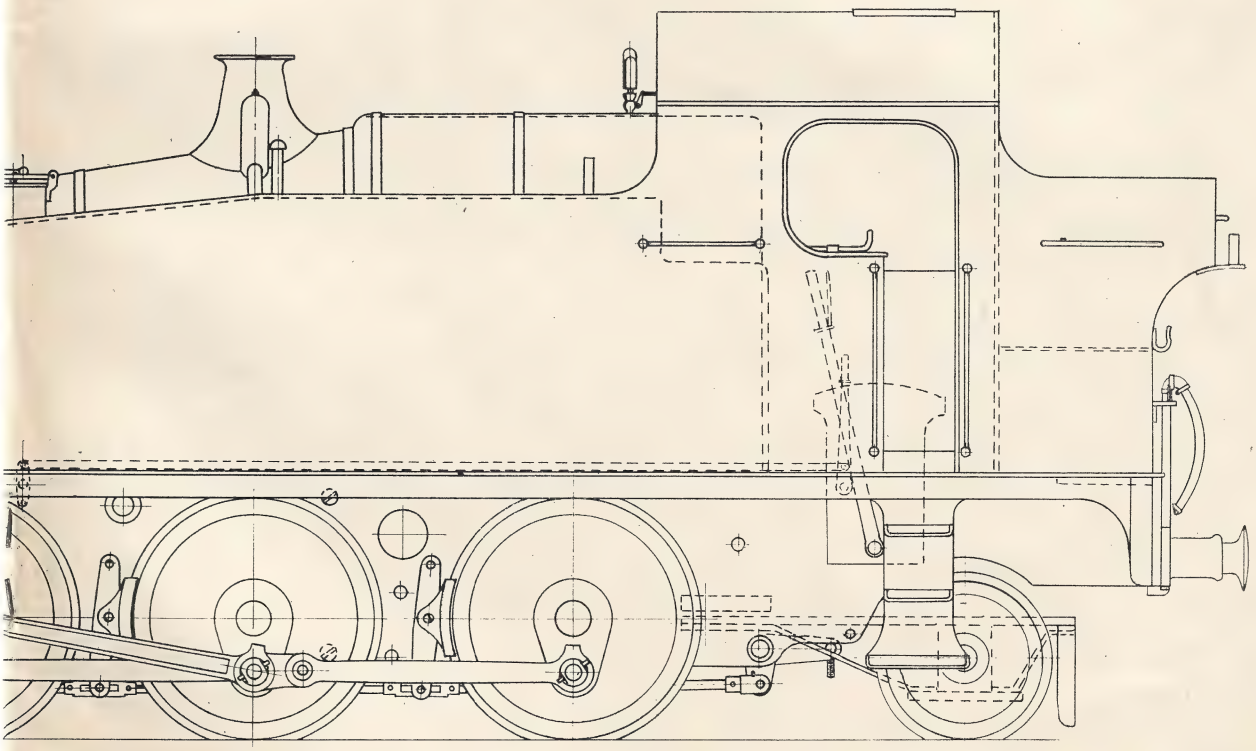
The 4575-5500 series engine was built under the Collett regime from 1927 onwards; it forms the subject of our model.

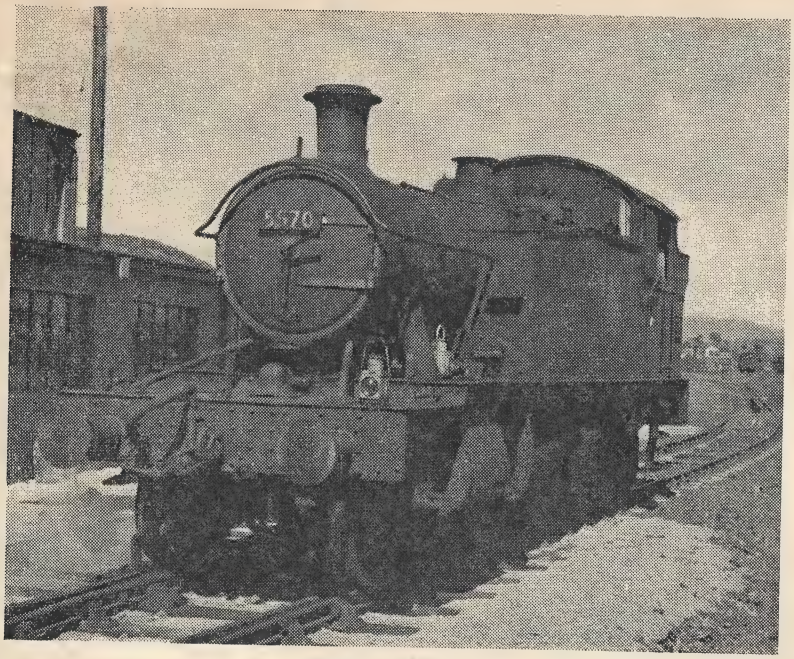
To meet the wishes of as many readers as possible, I shall be describing *Firefly* for three gauges—5 in., 4¾ in., and 3½ in. Most of the drawings and descriptions of the 5 in. gauge model will, of course, apply to the 4¾ in., any alterations necessary for the smaller gauge being dealt with as we come to them. The 5 in. and 3½ in. designs are being worked out independently, as I have never held the idea that one can simply scale the larger engine down to make a successful model for the smaller gauge, or vice versa.

For the modeller, the 4500 class is not by any means easy. Besides the rather tricky shape of the boiler, the design of the valve gear and the method of supporting the slide bars pose some very awkward problems, while the pony trucks too are rather complicated to model with any accuracy.

Please do not think that I am trying to put anyone off; I am referring only to the problems of design. There is nothing frightening about the construction, and even the taper boiler can be dodged. A fairly useful boiler could be made by using a parallel barrel, and representing the tapered part by the lagging and cleading, the firebox remaining unaltered. (I hope no one will do this all the same !)

The pony trucks for the 3½ in. gauge model will be of extremely simple





*Engine at Pwllheli*

**For the benefit of American readers, Martin Evans will describe modifications to " Firefly " to suit the US and Canadian gauge of 4¾ in.**

design, having only a central (vertical) spring, and no side control. They could be made in a few evenings. The 5 in. and 4¾ in. gauge pony trucks, on the other hand, will be fairly close to Swindon appearance, will be built up from steel sections, and will have individual springing as well as side control. But there is no reason why the extra detail on the larger truck should not be built in the 3½ in. gauge size if the builder prefers.

Cylinders on all the models will be of the slide valve type, 1 in. × 1½ in. for the ¾ in. scale, and 1½ in. × 2⅛ in. for the 1 in. Boiler working pressures are 90 lb. and 110 lb. and so there will be plenty of power for passenger hauling.

No doubt Swindon enthusiasts will be wondering how I propose to deal with the unusual type of frame construction. On the full-size locomotive, the main-frames proper end at the cylinders, and the short extension to the front buffer beam is a heavy slab bolted on behind the cylinder. As this is not a very practical method in a model, I am making the main-frames the full length of the locomotive, and riveting on a strong thickening piece behind the frame itself above the front pony truck where the frame is weakest. The cylinders can then be of the conventional pattern, and the saddle a separate casting.

As castings, especially gunmetal, are expensive, I am only using them where they are essential—for the wheels, cylinders, axleboxes, main horns, saddle, pump, chimney and so forth. All the frame stretchers will be cut from steel bar, and bar will also be used for the pony truck horns in the larger engines.

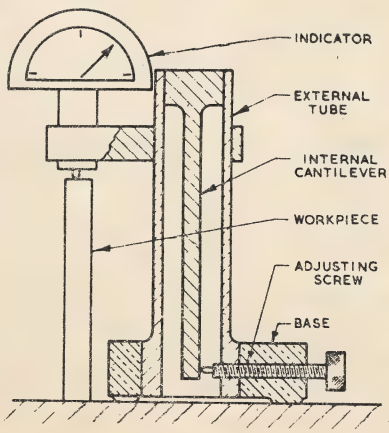
The water capacity will be useful, as a bunker water tank, connected to the two side tanks by the usual balance pipes, is arranged the full width of the engine. Boiler feed can be by a crosshead driven pump on the right-hand side of the locomotive, the pump being made to represent the GW air pump. An injector can also be fitted with advantage, if the side tanks are well lagged to prevent the water in them from getting too warm.

My drawings will show hand brakes on the 3½ in. model, and both hand and steam brakes on the larger models. To allow easy removal of the grate and ashpan, the intermediate brake beam can be cut, and the brake pull-rods, which will lie very close to the back of the wheels, silver-soldered to the intermediate brake hangers. Compensation therefore cannot be arranged, but this is a small sacrifice for such an advantage as quick removal of the grate.

Our *Firefly* should be a handy engine for club running, self-contained and not too heavy, even in 5 in. gauge, to be handled on and off the track. With the high cab and bunker suitably designed, and a larger-than-scale firedoor, she will not be at all difficult to fire, even on the run, and as neither the cylinders nor the driving wheels are especially large even those with quite small lathes will be able to tackle her.

Am I building her myself ? Well, as most readers know, I am heavily committed with *Springbok*. But I shall certainly make a start on the 5 in. *Firefly*; I must have the frames in front of me, just to make sure that everything fits, and—who knows ?—I may find time to finish her one day.

★ *To be continued on February* 23




## PRECISION INDICATOR STAND

THE introduction of high sensitivity dial indicators calls for the use of stands better than the normal scribing block type, which is not sufficiently rigid and is too crude in its method of adjustment.

A very simple method of adjustment is introduced in a new stand developed at the National Physical Laboratory. The column of the stand is a steel tube, rigidly fixed to the base, and having an internal cantilever bar rigidly attached at the upper end. An adjusting screw applies pressure to the lower end of the bar, with the result that the tube bends slightly to provide a very fine and accurately controllable movement.

Initial coarse setting is provided by a universal bracket, in which components are clamped to cylindrical columns, arms and stems by a simple spring-steel band clamp. Compared with conventional bored split castings, these clamps are lighter and allow for interchangeability of components with less close tolerance on the diameter of the columns.

*After finishing the throttle block of the 3½ in. gauge LNER Pacific, the modeller sets to work on the slide valve and actuating gear, steam pipe, flange and fittings for the backhead*

# HIELAN' LASSIE

**By LBSC**

Continued from 12 January 1961, pages 51 and 52

On the centre-line of the top of the boiler barrel, in front of the dome bush, drill two No 30 holes and countersink them, for the screws holding the block in place. The first is 5/32 in. ahead of the bush, and the second ¼ in. further along.

Now insert the block temporarily in place, putting it in wide end first, and tipping it up. If you have any difficulty holding it in place with pliers, put a few threads on the end of a bit of $\frac{5}{16}$ in. rod, or the steam-pipe, poke it through the hole in the smoke-box tubeplate, and support the block with that, screwing the rod into the steampipe hole. Put the No 30 drill down the screw-holes, and make small countersinks on the block, or mark with a scriber.

Remove the block, drill the marked places No 40, and tap ⅛ in. or 5 BA. Take off the sharp edge at either side of the top of the block, where the screw-holes are, ahead of the nick; the section with the port must be faced truly, like the port faces of the cylinders.

The slide-valve is a little block of gunmetal or bronze, $\frac{3}{16}$ in. high, ⅜ in. long, and 9/32 in. wide. The easiest way of cutting the groove for the actuating pin is to drill a No 30 hole lengthwise through the block, saw down to it each side, and trim up with a file. The bottom is faced in the same way as the engine slide-valves. There is, of course, no cavity to cut.

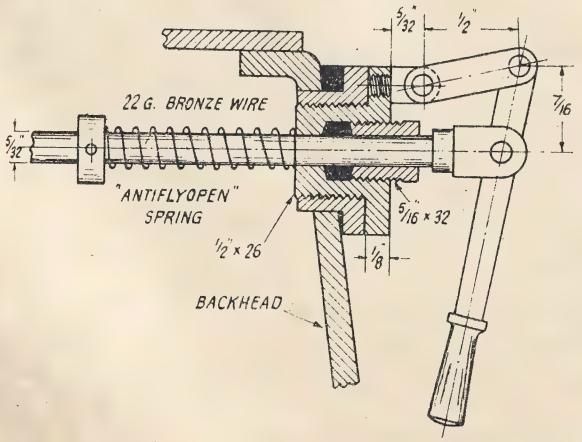
The valve is operated by two double-armed levers, one at each side of the block, pivoted on shouldered screws seated in the holes already mentioned. There is a connecting-piece or crosshead at the bottom, into which the regulator rod is screwed. A pin passes through the top of both, and lies in the groove in the slide-valve, so that any movement of the regulator handle is transmitted *via* the rod, crosshead, levers and pin, to the slide-valve. Any non-rusting metal—brass, copper or bronze, either nickel or phosphor—will do for the levers; cut them to the size given in the illustration, and either drill both together, or mark out and drill one and then use it as a jig to drill the other. File off any burrs.

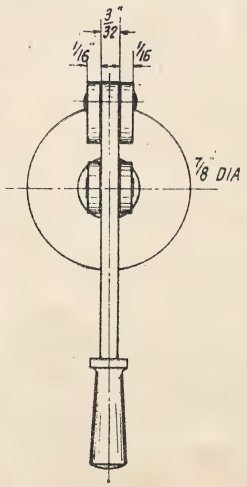
The connecting-piece, or crosshead. is made from a piece of ⅜ in. × ¼ in. brass rod. Chuck truly in the four-jaw; face, centre, drill down ¼ in, with No 30 drill, and tap 5/32 in. × 40. Turn down ¼ in. length to ¼ in. dia., and part off ⅝ in. from the end. At ⅛ in. from the end, drill a No 30 cross hole; round off the end with a file, and slightly reduce the thickness to 7/32 in., as shown.

Next turn up the two pins for connecting the levers; they are pieces of ⅛ in. round rod—bronze for preference, although brass will do—and are $\frac{11}{16}$ in. full length, with 5/64 in. of each end shouldered down to a tight fit in the holes in the ends of the levers. The distance between the shoulders must be ⅜ in. full, so that the levers, when assembled, slip easily over the throttle-block and valve, without being too slack. Rivet one pin into each end of one lever; put the crosshead over one of the pins and then put on the other lever and lightly rivet over the ends of the pins.

Turn the shouldered screws from a bit of ¼ in. bronze rod held in the three-jaw. First turn down about $\frac{3}{16}$ in. length to ⅛ in. dia., to fit the centre holes in the levers; then turn down a bare ⅛ in. of the end to 7/64 in. dia. and screw 6 BA. The plain part should be just wide enough to allow the lever to swing freely when the screw is right home, with its shoulder hard against the throttle-block. Part off to leave a head about ⅛ in. wide, and slot it with a thin hacksaw blade.

To assemble, put the valve under its pin, slide the whole over the narrow end of the throttle-block, and put the screws through the holes in the levers, with a taste of plumbers' jointing on the threads, carefully washing away any surplus with a brushful of




*Regulator gland and handle*

paraffin. Put the complete assembly back in the boiler again and secure the block to the barrel with two countersunk-head bronze or brass screws.

The steam-pipe is a piece of 20 or 18 gauge copper tube $\frac{5}{16}$ in. dia., and $8\frac{1}{4}$ in. long. One end is screwed $\frac{5}{16}$ in. × 32 for a bare $\frac{1}{2}$ in. and the other screwed for about $\frac{3}{16}$ in. the same pitch as the thread in the throttle block. Anoint this end with a smear of plumbers' jointing, and screw it home into the block, through the hole in the smokebox tubeplate. Some prefer to notch the end, but all I do is to jam the end of a round file in the end of the tube, which locks itself and allows the file to be used like a screwdriver. The file frees itself when turned backwards; it always obliges me, at any rate !

The section behind the contact face will be hexagon, to allow for easy screwing home. Chuck in the three-jaw by the big flange, and set to run truly. Face, centre, drill right through with 7 mm. letter J or 9/32 in. drill, and tap $\frac{5}{16}$ in. × 32. The tap need not go right through; see sectional illustration.

Turn down $\frac{3}{16}$ in. of the outside to $\frac{1}{2}$ in. dia. and screw $\frac{1}{2}$ in. × 32. Reverse in chuck, gripping by centre part; face off the flange, and turn the outside to 1 in. dia.

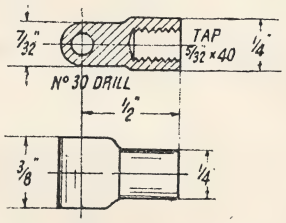
The flange fitting can also be turned from 1 in. brass rod; in that event, either file the centre part hexagon, or file a flat on each side to take a spanner. Put a smear of plumbers' jointing on the threads, and on the steam pipe, which should be just projecting from the hole in the tube-plate; then screw the fitting on the end of the steam pipe. When the external thread meets the tubeplate, it will engage with the thread in the tapped hole. All will be locked solid when the shoulder is hard up against the tubeplate.

The regulator-rod is a piece of 5/32 in. round brass or bronze, $12\frac{7}{8}$ in. long, screwed 5/32 in × 40 at both ends. A small brass collar $\frac{3}{8}$ in. dia. and about $\frac{3}{16}$ in. wide is driven on 2 in. from one end, and pinned by a bit of $\frac{1}{16}$ in. brass or bronze wire driven through a No 53 hole drilled through collar and rod. The rod is inserted through the bush on the backhead, and screwed into the boss on the crosshead between the levers at the sides of the throttle block. You can easily hold the boss with a bit of hooked wire while you are starting the thread. The collar should be at the back end.

To make the gland fitting, chuck a piece of $\frac{7}{8}$ in. brass or bronze rod in the three-jaw. Face, centre, and drill about $\frac{5}{8}$ in. depth with No 21 drill. Turn down $\frac{3}{8}$ in. of the outside to $\frac{1}{2}$ in. dia. and screw $\frac{1}{2}$ in. by 26. Part off at $\frac{1}{2}$ in. from the end. Reverse in chuck, holding either by the threads or in a tapped bush, and open out the No 21 hole to 9/32 in. for $\frac{3}{8}$ in. depth; tap $\frac{5}{16}$ in. × 32 or 40, and take a skim off the face to true it up. Make a gland from $\frac{5}{16}$ in. hexagon brass rod, using this size to keep the head as small as possible. Screw the fitting right home, and mark which is the top; then, at a bare $\frac{1}{8}$ in. from the top, on the centre-line, make a centre-pop. Remove fitting, drill the pop with No 44 drill and tap 6 BA.

Make a little lug the same as the lugs on the smokebox door, the stem screwed 6 BA and the lug itself made 3/32 in. in thickness and a bare $\frac{1}{4}$ in. wide. Drill it No 30, and screw it into the flange. It can now be screwed home for good; but first put a spring, wound up from 22 gauge phosphor bronze hard spring wire, over the regulator rod, letting it go up against the collar. This should come about level with the face of the bush when uncompressed. Put an oiled paper washer over the gland fitting, and screw it right home, with the little lug at the top.

The action of screwing home the fitting will compress the spring sufficiently to prevent any tendency of the regulator to fly open when the boiler is in steam and there is pressure

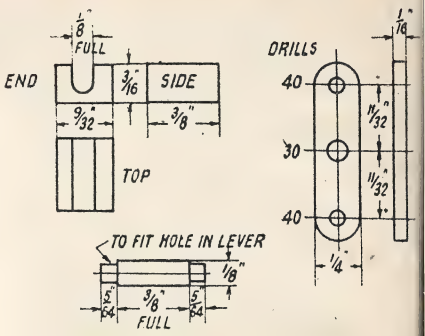



*Crosshead for regulator rod*

on the end of the rod. Pack the gland with a few strands of graphited yarn, and screw the gland nut in fairly tight, but not tight enough to bind on the rod.

Make the regulator handle from a 2 in. length of $\frac{1}{4}$ in. round rod. Chuck in the three-jaw, turn the handle either to shape down, or to your fancy. File the rest flat, to a thickness of 3/32 in. and slightly taper.

Drill two No 30 holes in it $\frac{7}{16}$ in. apart, as shown, and attach it to the lug on the gland flange by two links like the pump links, filed up from $\frac{1}{4}$ in. × $\frac{1}{16}$ in. strip, if possible of the same kind of metal as the regulator handle. The links are drilled No 32; the pins are made from $\frac{1}{8}$ in. round rod, any metal, and squeezed through the holes in the links. They should be a nice working fit in the holes in both regulator handle and lug.




*Regulator slide-valve and links*

Bolts may, of course be used if they are made from $\frac{1}{8}$ in. round rod, and shouldered down to take a 3/32 in. nut each end, for neatness sake, but I prefer pins. A fork or clevis is made from $\frac{1}{4}$ in. square rod, exactly the same as those described for the valve-gear, and screwed on to the end of the regulator rod, the handle passing between the jaws, as in the illustration, and secured either by a pressed-in pin or by a bolt with reduced ends and nuts.

When the handle is pushed right in as far as it will go, the crosshead on the front end of the regulator rod comes up against the underside of the throttle block, which acts as a stop; the levers incline backwards and move the valve so that it completely covers the steam port, overlapping by about $\frac{1}{16}$ in. each end, and if the valve and the block have been truly faced there will not be any suspicion of steam leakage. When you pull the handle, the valve first uncovers the apex of the triangular-shaped port, thus ensuring gradual admission of steam. There is no real need to provide any stop for the full-open position, as the valve cannot run off the port-face, and will come up against the bush (see plan diagram) if the handle is pulled too far.

To prevent the valve from falling off the port-face when the engine is turned upside down for any reason, and thus allowing grit or scale from the water to get between the sliding faces and cause leakage; a small flat spring, made from thin bronze strip is attached to the inside of the dome cap by a single 3/32 in. brass screw, as shown in the sectional illustration of the complete regulator. It does not need to press on the valve very hard; just sufficiently to keep the sliding surfaces always in contact. A spot or two of cylinder oil introduced through the screwed plug on the top of the dome cap every now and then will ensure adequate lubrication and prevent sticking or leaking of the valve.

★ *To be continued*

# MODEL HYDROPLANE HULLS

*Continued from 26 January 1961, pages 116, 117 and 118*

**From St Albans comes this design for an**

# UP-TO-DATE D CLASS BOAT

**EDGAR T. WESTBURY describes it**

WHAT I have written on the basic design and constructional methods of hydroplane hulls should be helpful to those who wish to design and develop their own boats, but there are many readers who do not wish to go to the trouble of working these methods out for themselves. They demand ready-made designs. Though I am anxious to do my best for them, I would caution them that it is one thing to copy a successful design, and another to be able to run, tune and develop it successfully; many constructors have made close copies of record-breaking boats without ever achieving comparable performance.

There is much to be said in favour of starting off with less ambitious designs as a means of obtaining the necessary knowledge. The hull designs already available, although they do not conform with modern methods of tethering or the use of surface propellers, are efficient and easy to run; the ME 24 in. hydroplane hull has been used as a stepping-stone to further progress by many constructors who have since achieved great success with more advanced designs. If it is argued that messing about with outdated designs is simply a waste of time, I may say that one is liable to waste even more time in trying to run before one has learned to walk. But for those who demand a hull of up-to-date design which the beginner can build with reasonable prospect of success, I am eager to do all that I can.

The hull which I propose to describe here is not one of my own design, because although I have followed closely all modern developments, and have quite a few ideas of my own which I believe to be original, it would not be discreet to turn them loose on readers without subjecting them to actual test beforehand.

The fact that I have not taken part in competition racing with model hydroplanes for many years, while it perhaps qualifies me as a pondside critic, does not entitle me to expect readers to accept my ideas on design with complete confidence. Everyone knows that to scheme out plausible and attractive designs on paper is quite different from guaranteeing that they will perform according to plan. Nearly all the successful models I know have been produced to the formula of Thomas Alva Edison—"five per cent inspiration and 95 per cent perspiration."

In introducing the simple but efficient hull illustrated, I should explain that it is based on a series of experimental hulls by Ken Hyder, of the St Albans Society; his consistent success in the CR class (for boats with commercially-produced engines up to 10 c.c.) makes it unnecessary for me to say more about his qualifications. Some of his hulls have produced excellent results with still smaller engines, and in collaboration with Peter Lambert of the same society he has developed and simplified their design so as to make them particularly suited for construction by beginners.

Hulls built to this design have had well over a season's testing in actual regatta competitions by the designers, and also by our first lady hydronaut (to coin a term) Mrs Pauline Husbands, whose story has been told here. In response to my appeal for constructional information on hulls from those who have built and developed them, the drawings of Mr Hyder's hull have been handed to me for use in these articles. I have taken the liberty to make a few very minor alterations to the design, mainly with a view to improving and strengthening the structure, but I have taken no liberty at all with the outlines or planing angles.

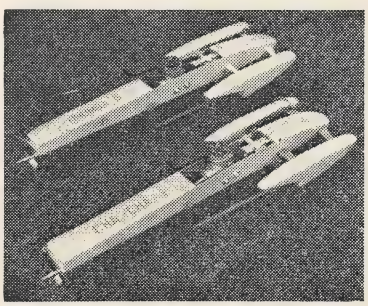
The constructional simplicity of the hull should commend itself to those who have not attempted to build a boat before, as the hull needs no framing in the accepted sense and can be assembled without a building board or jig. I would, however, caution readers who may wish to adapt the design to suit boats with engines larger than 5 c.c.—which could be done quite successfully—that a somewhat more elaborate form of structural design would then be desirable.

As will be seen, the hull is of the outrigger or sponson type, with a main body 26¾ in. long × 2 in. beam,

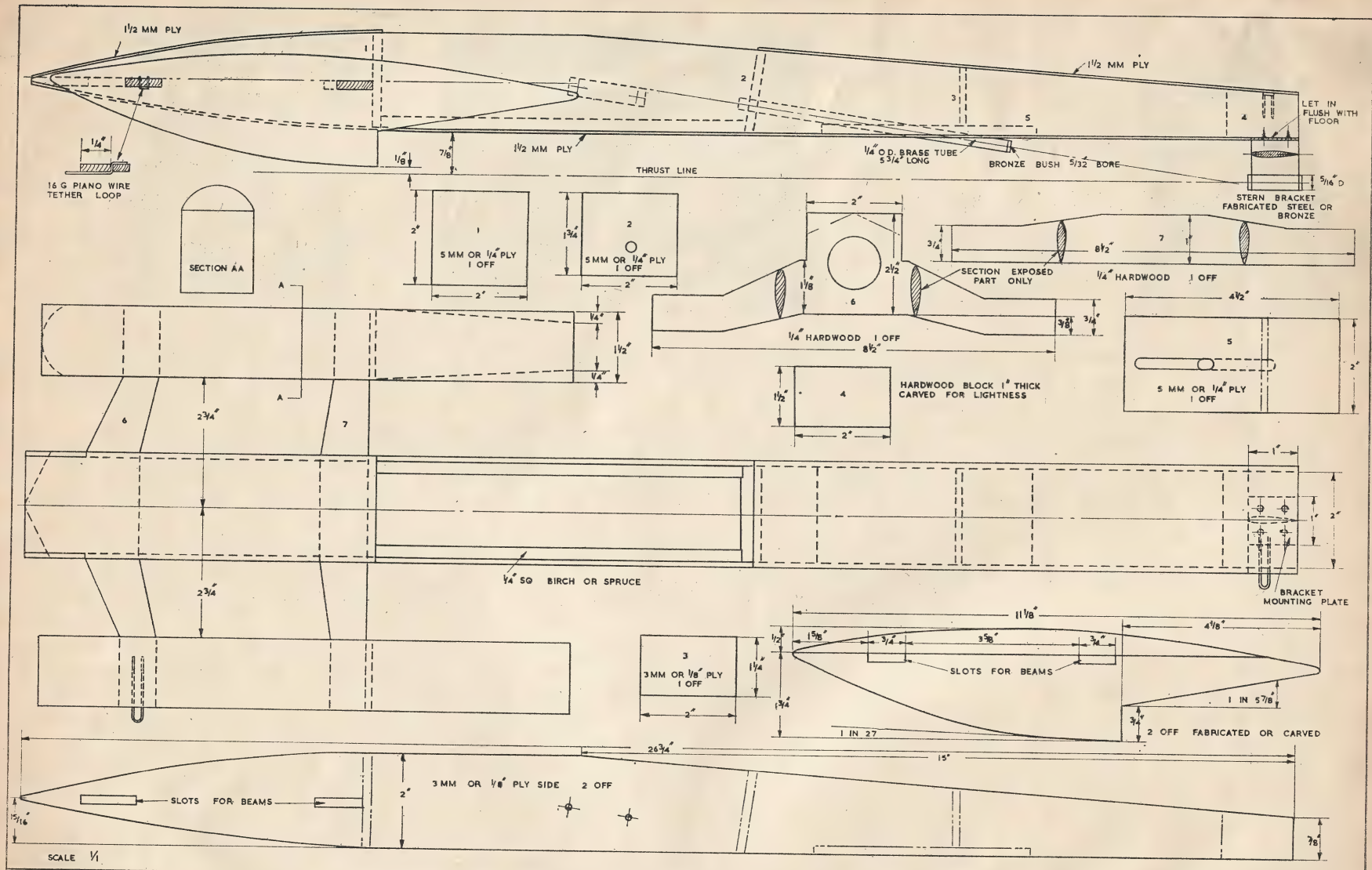
*Copyright Birmingham Gazette & Despatch Ltd.*

*A handsome, streamlined boat,* NAIAD III, *by Tom Dalziel*

*Three of these hulls, seen at St Albans, were made by Mr Peter Lambert and Mrs Husbands*



*Two 5 c.c. hulls built to design described*


1½ MM PLY
1½ MM PLY
1½ MM PLY
LET IN FLUSH WITH FLOOR
¼" O.D. BRASS TUBE 5¾" LONG
BRONZE BUSH 5/32 BORE
THRUST LINE
5/16" D
STERN BRACKET FABRICATED STEEL OR BRONZE
16 G PIANO WIRE TETHER LOOP
SECTION AA
5 MM OR ¼" PLY 1 OFF
5 MM OR ¼" PLY 1 OFF
SECTION EXPOSED PART ONLY
¼" HARDWOOD 1 OFF
¼" HARDWOOD 1 OFF
HARDWOOD BLOCK 1" THICK CARVED FOR LIGHTNESS
5 MM OR ¼" PLY 1 OFF
¼" SQ BIRCH OR SPRUCE
BRACKET MOUNTING PLATE
3 MM OR ⅛" PLY 1 OFF
SLOTS FOR BEAMS
2 OFF FABRICATED OR CARVED
SLOTS FOR BEAMS
3 MM OR ⅛" PLY SIDE 2 OFF
SCALE 1/1

# HYDROPLANE FOR 5 CC ENGINES

DESIGNED BY KEN HYDER & PETER LAMBERT

PB 28

of box girder section. It is built up with side pieces of 3 mm. or $\frac{1}{8}$ in. three-ply, with $1\frac{1}{2}$ mm. or $\frac{1}{16}$ in. three-ply floor and decking, three cross bulkheads, and a solid stern block, together with additional reinforcement at essential points. The sponsons are carried on solid cross beams which pass right through them and the body as well. Only very easy curves are involved, and these are only in elevation, as the sides are dead straight; no steaming of timbers is, therefore, necessary. If desired, the forward end of the hull, and also the sponsons, may be faired off in a curve or gable, as indicated by the dotted lines in the plan view. The after ends of the sponsons may be tapered, or tumbled home, to 1 in. wide. It would also be permissible to narrow the stern of the body in a somewhat similar manner, but not so much as to impair buoyancy at this end, which must carry the weight of the stern bracket and propeller.

The sides may be temporarily tacked or otherwise fixed together for cutting accurately to shape and trimming the edges. Next, the cross bulkheads (1, 2 and 3) and stern block (4) should be cut out, but before they are assembled in between the the side pieces, the sponson support beams (6 and 7) should be cut out and fitted as closely as possible to the slots in the sides. Note that the parts of the beams which are exposed between the hull and the sponsons should be streamlined to cut down air and spray resistance, but the cross-sectional area should not be reduced more than is necessary to fair them off nicely. Ash is a suitable timber if well-seasoned pieces can be obtained, but to obtain the utmost possible strength without adding too much weight a piece of $\frac{1}{16}$ in. sheet steel may be sandwiched between two pieces of 3/32 in. wood and cemented with Araldite, under pressure and preferably under moderate heat as well. As the beams take considerable stress and are difficult to repair if they get damaged, it is just as well to take every possible precaution to make them permanent.

Before fitting the stern block (4), you may carve it out to reduce its weight, so long as sufficient material is left to ensure its rigidity and give a good hold for the screws or bolts which secure the stern bracket. A router or slot milling cutter, run at top speed in the lathe, may be used for this operation, with the block clamped to an angleplate or vertical slide; the thickness at any point should not be reduced beyond about $\frac{3}{16}$ in.—rather more for the floor. Alternatively the part may be built up from four pieces, to form an open-ended box.

The bulkheads (1, 2 and 3) may now be inserted, and fixed by pinning and gluing, and also the floor reinforcing piece, which is slotted to allow the passage of the stern tube, fitted in this way because it would be extremely difficult to drill a round hole at such an angle so as to obtain its correct location and alignment. The edges of the bulkheads, and the under face of the floor piece, should be trimmed dead flush with the bottom edges of the sides so that the floor covering will bed down without distortion.

*Salvage operations*

It is a good policy, before proceeding further with the construction, to fit the engine and stern bracket, and line up and fix the stern tube, as the work can be done easier now than when the hull is finished; these parts will be dealt with later, after details of the hull work have been described. The floor should be laid in one piece if possible; it will be necessary to taper off the front of the forward sponson beam centre section to bed it down properly at this point, but to avoid showing the edges of the three-ply, it would be an advantage to fit a solid nose-piece and notch-in the floor-piece—or joggle it as shipwrights say.

Further reinforcement of the floor is obtained by fitting $\frac{1}{4}$ in. square corner strips in the 'midships engine space or cockpit; it is immaterial whether these are fitted before or after attaching the floor as they are dead straight and need no trimming to shape. I recommend that the parts of the floor which are not reinforced in this way should be given some treatment to avoid the risk of opening up the seam under stress or warping. There are several ways of doing this, such as by gluing strips of tape or silk in the inside corner, or by using pattern-maker's leather, plastic filleting, or a neat fillet of plastic wood.

The forward and after deck fairing is attached in the same way as the floor; it may be done either now or after the installation of the plant. Some constructors may consider it desirable to make the enclosed compartments watertight to prevent the risk of the boat sinking after a capsize; this is a sound policy, all too seldom observed, but it is advisable to provide some means of draining the compartments in case water should somehow get in—as it does in the best-constructed hull; otherwise one may be carrying quite a lot of unwanted water ballast without realising it.

The sponsons may be carved from the solid, or built up in much the same way as the main hull. Balsa wood has been used in the hulls illustrated, and has apparently given complete satisfaction.

**Carving in balsa**

Because of the facility which balsa offers for carving to shape, it is possible to streamline the upper parts of the sponsons and make them very elegant in appearance, but the underside shape, and particularly the tangent angle at the step, should be closely observed. The sponsons are, of course, miniature single-step hulls, but the part aft of the step plays no part in their planing efficiency. Its function is mainly to act as a spray guard—hulls without this provision have sometimes been known to direct a steady stream of water into the cockpit—and it also contributes something to the static buoyancy of the complete hull.

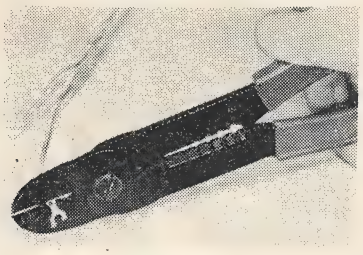
Here, too, the sponson beams should be fitted closely to the slots, and before final assembly provision should be made for attaching the boat to the tethering bridle. It is extremely important that this should be perfectly secure, because no hull can be expected to survive escaping from its orbit and crashing into a concrete bank at 50 or 60 miles an hour—apart from the risk of personal injury. (I thought I had done very well when I produced a hull which proved capable of surviving after a 30 m.p.h. crash.) However elaborate the connecting device, the important thing is that it must be equally well anchored to the hull; the simple staples bent from 16 s.w.g. piano wire (*not* copper, brass or galvanised iron), and secured in the way shown in the drawings, will do all that is required.

★ *To be continued on February* 23

# AROUND THE TRADE

## Solderless connections

EVERYONE concerned with electrical or electronic apparatus knows the importance of making all connections secure and sound electrically and mechanically. For most purposes, soldering is generally recommended, but situations often arise where this is inconvenient or even impracticable. Hellerman Ltd, of Crawley, Sussex, who are specialists in electrical connections, have introduced a special tool for connecting terminal tags to



cables without the need for soldering or any application of heat whatever.

The terminal tags are of special design, and are attached to the wires by crimping, using the special Crimpmaster tool, the jaws of which are specially shaped to deal with two sizes of wires and tags. The Crimpmaster also incorporates a wire cutter and a stripping tool for insulated cables of six different sizes. After stripping, a terminal of appropriate size is slipped over the end of the wire and engaged in the corresponding notch of the Crimpmaster tool jaws, which are then closed hard on it to make a secure connection.

Included with the Crimpmaster kit are the tool shown and a supply of terminal tags in two sizes, and of various shapes, including ring, spade and tongue types. We have found that connections made by this method have a low electric resistance and high tensile strength. Hellerman's are also the originators of the rubber sleeve method of protecting terminal ends to prevent fraying of the covering, and reinforcing what is otherwise a weak spot. The kit for applying the sleeves comprises one fitting tool, one wire stripper, an assortment of sleeves in red and black, earth markers and a supply of rubber lubricant.

## New Sifbronze list

Two additions to a wide range of products are included in the revised price list of The Suffolk Iron Foundry (1920) Ltd, Stowmarket.

Silver solder No 38, in the copper welding and brazing alloy group has a low melting point of 620 deg.-640 deg., and Sifcut No 40, in the cast iron and hard surfacing alloys section, is a composite rod of tungsten carbide particles in a nickel Sifbronze matrix.

The lists also shows the two-in-one pack—a combined welding and cutting outfit in a neat metal box— and two of the foundry's products, the Colibri cutting machine and the all-electric Combi cutting machine.

Write for the list—it costs nothing —to Suffolk Iron Foundry (1920) Ltd, Sifbronze Works, Stowmarket, Suffolk.

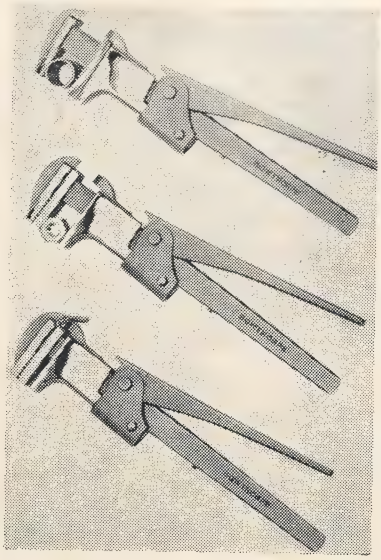
## Many purposes

A REVOLUTIONARY multi-purpose tool may be had from Bowthorpe Electric Co. Ltd, the sole agents for distribution in Britain.

The tool can be used as a spanner on nuts up to 2 in. in size, as a pipe-wrench, and as a wire cutter for wires up to $\frac{1}{4}$ in. dia. (as illustrated).

It is robustly made of chrome vanadium, and is 12 in. long, with a weight of $2\frac{1}{2}$ lb. The makers believe that it will have a wide appeal to industry, in particular where heavy work calls for long-lasting tools.

Further details may be had from the Bowthorpe Electric Company Ltd, Crawley, Sussex.

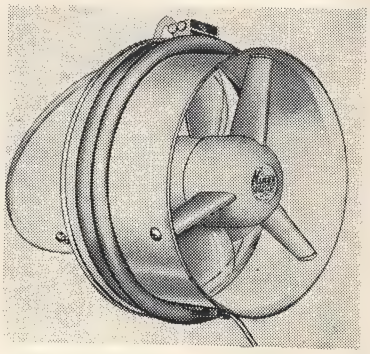


## What is an extractor fan?

So far the British housewife has been slow to recognise the importance of regulating the air changes in a room. Fumes and steam are allowed to pervade the kitchen for hours each day. The fug from smoking permeates the fabrics in the house, and only the toilet and bathroom have an airbrick.

An extractor fan fills the room, in which it is fitted, with fresh air. The decorations and furnishings last longer, there is no discoloration from fumes, and the living room and kitchen lose their smell.

How often does one see a room with the walls running in water from condensation, with the wallpaper coming off, and with stained patches !



An extractor fan consists of a small motor driving a fan blade, which is mounted in a hole in a window or wall. The fan pulls the air out of the room and new air is brought in to take its place.

Four years ago, when fans were expensive, Jones and Stevens Ltd, introduced the inexpensive Minex. It sold over 20,000 in three years. The manufacturers were flattered when others copied it.

While the Minex Mark I and Mark II are extremely efficient, Jones and Stevens are continually trying to solve all the design problems. The main disadvantage of any fan is that when a propeller is revolving quickly it makes a noise as it cuts the air. Careful design of the whole unit can reduce the noise, and it is readily established that a large fan turning slowly can move at least as much air as a small fan turning quickly. Of course, a small fan rotating rapidly gives the impression, because of the noise, that it is doing more work. But the noise can be irksome when it is always present.

There is a limit to the size of fan which would be practical for a small window or room. The new Minex Mark III is ideal.—larger than the earlier models, but still small enough

to fit into a 9⅛ in. hole. An 8 in. fan blade, employed with a powerful 40 w. four-pole totally-enclosed motor, gives the maximum extraction—without buzz.

In addition the Minex super fan does not obstruct light. The external louvre is transparent.

When the fan is switched off the air excluder can be adjusted to admit fresh air, the fan blade revolving freely on its own in a reverse direction.

The selling price complete—there are no extras—is £6 19s. 6d. Write to Jones and Stevens Ltd, Eastern Bypass, Little more, Oxford.

## Special tools

MOORE AND WRIGHT LTD, of Handsworth Road, Sheffield, have a "specials" department where micrometers and other tools are made to customers' specifications. Through the years a great number of special tools has been made, some large and some small, for almost every precision measuring job.

Recently Moore and Wright produced three 60 in. workshop grade engineers' trysquares. This size square is a little unusual, to say the least. The workman standing by the side of the square in the picture, holds a 5 in. square for comparison.

It may also interest readers that a short time ago Moore and Wright made a 72 in. square.

## Hornby controller

THE owner of a Hornby (Marshal) III power control unit who wishes to run a second tractive-type mechanism can now do so with the aid of the new No 0041 Hornby (Marshal) controller. This unit must be connected with the C output terminals (15 v., a.c.) of the Hornby (Marshal) III. The input terminals can also be connected to either the

X or Y output terminals (15 v., a.c.) of the T15 safety transformer.

There are eight forward and eight reverse speeds. For really fine speed control, pulse power has been incorporated, and the method of control is similar to that of the Hornby (Marshal) III.

The complete control mechanism is extremely light and is housed in a strong plastic case, coloured grey. The control panel is made of light alloy, with letters and figures showing clearly in matt silver on a black background.

Hornby (Marshal) controller No 1041, costs 35s. from Meccano dealers.

## Twelve easy lessons

SOFT solder is made from tin and lead. Tin has a melting point of 232 deg. C. (450 deg. F) and lead of 327 deg. C (621 deg. F), but when the two metals are mixed the alloy has a lower melting point than either of them. It begins to meet at 183 deg. C (359 deg. F)..

Cornwall used to provide tin for the world, and lead was one of the earliest metals used by man. . . .

All this information and much more—together with 12 easy lessons in soldering—may be found in a booklet issued free by Fluxite. Send stamped addressed envelope (3d. stamp) to Fluxite United, Dragon Works, Bermondsey, London SE1. Ask for "How to Solder", say that you are a reader of MODEL ENGINEER.

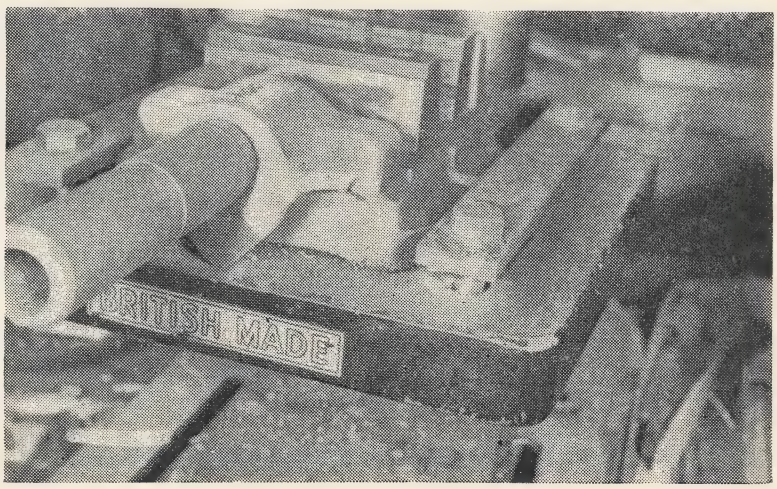
# Clamping device

***Readers' work***

ACCIDENT statistics show that drilling machines cause a large number of injuries. As the accidents usually occur when the operator is holding the workpiece on the machine table, a machine vice, or some sort of clamp, should be used whenever possible.

A useful device to avoid loss of time in setting up, consists of two steel strips, not less than ¾ in. × ⅜ in. section and of adequate length, drilled at each end to clear hexagon head bolts. In the Fobco Star drilling machine table the underside ribbing keeps the nuts captive, the strips being drilled to allow the bolts to pass through the machine table slots. When the bolts are slacked off, the vice has a big range of fore and aft movement, with slight sideways movement which in any event can be supplemented by swinging the machine table. The material surrounding the machine vice lugs may have to be ground flat to give a good bearing surface beneath the holding-down strips, but no other alteration is needed.

With this device work can be positioned rapidly.—R.C.



# READERS' QUERIES

**DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE OF THIS ISSUE**

**This free advice service is open to all readers. Queries must be of a practical nature on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling cannot be given. stamped addressed envelope with each query: Mark envelope clearly "Query," Model Engineer, 19-20 Noel Street, London W1.**

## Traction engine gears

Very many thanks for your helpful reply to my recent enquiry on boiler materials. The boiler is now taking shape, but there is another matter on which I would appreciate your guidance. It concerns the gear ratios of my 2 in. Marshall traction engine.

I am copying an engine owned by a local farmer, and I was all set to use the same ratios as the full scale engine—15 : 1 top, 30 : 1 bottom—when I read an article in ME in August 1957, by Mr H. Winton, in which he explains why he chose the ratios of 5 : 1 top, 8 : 1 bottom for his 2 in. scale Fowler.

As I am loath to depart from true appearance, the gears on show on crankshaft and second shaft, must remain true to scale. I wish to keep the gear covers as true to scale as possible, and so it will be difficult to reduce them, except for making a reduction in size of the final gear. I have a fine 72-tooth 10 d.p. gear, which was cut by a friend as a gift, especially for this final gear, before I read your article.

So my problem is this: If I use ratios of the full-size engine, am I likely to run into serious trouble with wheel-spin every time I open the regulator, and would I be well advised to take a leaf out of Mr Winton's book and raise the ratios ?

I shall not have as much power available as Mr Winton. The bore is 1.4 in. and stroke 1.66 in., and I wish to develop as much drawbar pull as possible.

There is the point too, that raising the ratios reduces the power available on the winding drum, where wheel-spin is not applicable.—J.B., Broadway, York.

▲ *It would be quite practicable to use the same ratio as on the full-size engine. The only difficulty is that the actual speed of the model using these ratios may not be found high enough for towing or other active work.*

*If the original gear ratios are employed, the speed of the model will be in exact proportion to the scale, assuming that all parts, including the driving wheels, are correct to scale. If the full-size engine was geared to run at four m.p.h. in top gear, the 2 in. scale model would run at 1/6th of this speed—¾ m.p.h. For this reason, many constructors of models prefer to fit rather higher gear ratios, as very slow speeds are not impressive. For a given size of engine, the drawbar pull will be in proportion to the rate of gear reduction up to the point at which the driving wheels lose adhesion.*

## Bothersome belts

I am wondering if your workshop specialists can help me in what may be to them a simple matter. Among my workshop tools is a little Boley instrument maker's drilling machine.

I have been having trouble with driving belts. I have tried them all —leather (round) plastic, gut and everything else that I can think of, but they persist in breaking. Leather has not enough real body in it these days. In one afternoon I had four belts break in succession—all of different material.

It is an adjective nuisance. At the moment I am using an old boot lace twisted and screwed into a ⅛ in. hook and eye fastener.

I believe that rawhide would be the answer. I remember that it solved certain difficulties for me in the first war. Can Edgar T. Westbury tell me whether I can get some about 18 in. long in say ⅛ in strips ?

The trouble is not one of driving the machine with too tight a belt, as the tightness is only sufficient to drive tiny drills. Nor is pulley misalignment the cause. It is simply that the belts are of too poor a material to stand the strain of high speed drilling. Can you help at all ?—W.R.A., Stogursey, Somerset.

▲ *It is not easy to understand why the drive to your Boley drilling machine should be so troublesome. ME workshop has used various kinds of belting material for similar types of machines without encounternig the trouble you describe; on a small drilling machine the belt has lasted for over five years.*

*If you wish to obtain rawhide belting, it can be had from the British Rawhide Belting Co Ltd, 246/8 Great Portland Street, London W1.*

*It is also possible that a woven cotton belt might be suitable. You may be able to get it in the form of endless belts from manufacturers of belting such as Messrs Fenner and Co. Ltd, Marfleet, Hull, Yorkshire, or Stephensons Belting Co Ltd, Snow Hill, Birmingham.*

## Chingford Express colours

Can you please advise me where I may obtain suitable transfers for a Gauge 1 Chingford Express 0-6-0 tank locomotive based on the old GER suburban engines ? I received a set of drawings (L.O.54) from you and now I wish to have the transfers.

If the GER transfers are not obtainable, British Railway transfers would do.—R.S.P., Belfast.

▲ *You could try Messrs Bassett-Lowke Ltd, 112, High Holborn, W.C.1.*

*The Great Eastern colour scheme consisted of Prussian blue for boiler, firebox, cab sides, tender sides and back. Other parts were black. Buffer beams, guard irons and coupling rods were signal red. There was a red lining.*

*Royal engines had white roofs and additional lining. The insides of frames were chrome yellow.*

## King Arthur

I am rebuilding a 3½ in. gauge *King Arthur* class locomotive and wonder if you can tell me where I can get working drawings ? — A.G.B. Aberford, Yorkshire.

▲ *You may be able to get drawings of a 3½ in. gauge SR* KING ARTHUR *from Greenly and Steel, 6, Summerley Road, Princes Risborough, Bucks.*

## Compressed air test

I wish to put my 3½ in. gauge *Britannia* under a compressed air test. but I do not know how to set the valves and crank rods and in what position they should be. Could you please give me this information ?—D.J., Pemberton, Lancashire.

▲ *The piston valves should first be adjusted by hand to approximately their correct position.*

*A temporary connection should be rigged up to the steam chests, so that they can be supplied from a tyre pump or something similar.*

*Put the reversing lever in mid-gear, apply some air and turn the wheels slowly by hand. Just as the crank reaches each dead centre, there should be a loud hiss from the adjacent drain cock opening. If the hisses are uneven the valve needs adjusting on its spindle until they sound quite equal at each end.*

*If in spite of all adjustments, a hiss does not take place until the crank has passed dead centre, the valve is too long and will have to be shortened at the inner edges.*

## Vacant workshop: rust

I am going abroad for two to three years and I shall be unable to take my workshop equipment with me.

I should like your advice on what protective measures I should take with the pieces of equipment before I place them in storage. They are a Myford ML7 lathe, a 6 in. double-ended Selecta bench grinder, a ½ in. capacity motorised bench drill, and the usual small hand tools, chucks, and so forth.—G.W.A., Reading, Berkshire.

▲ *There are several kinds of protective oils and other preparations for this purpose. Ensis fluids, produced by Messrs Shell-Mex Ltd, are recommended—full information from Shell-Mex House, Strand, London, W.C.2. Oils containing lanolin are also very effective.*

*If your equipment is to be packed in boxes, which are not fairly open to the atmosphere (not crates), it would probably be helpful to line the boxes with VPI paper, which is specially prepared to inhibit rust. It can be obtained from Williams-Cook Ltd, 43-45, Brunel Road, East Acton, London, W.3.*

## Polythene vats

I have been reading your book, *Electro-plating for the Amateur* by L. Warburton, and I note that the author recommends the use of vitreous-enamelled bread-bins for plating baths. I wonder if polythene receptacles would serve.

Would a small charging plant of the "Tiny Tim" type serve as a source of power?

Have you any copies of *Flash Steam* by Edgar J. Westbury, and what is the price?—A.R., Michleover, Derby.

▲ *Polythene or other chemically inert plastic material should be quite suitable for electro-plating vats. In industrial plating, wooden vats are often used with interior coatings of bitumen or other acid-resisting paints, and caulked with pitch or marine glue.*

*The current depends entirely on the surface area of the components to be plated. For a few small objects, an accumulator or dry battery will supply sufficient current, but where the aggregate area to be plated is large the current must be correspondingly increased. The voltage needs to be only just sufficient to carry the current against the resistance of the plating bath.*

*It is also possible to use rectified A.C. of low voltage for plating, but the rectifier should be of the "bridge" or full wave type.*

*The PM Handbook* Flash Steam *is now out of print.*

## Solar cells

Could you please tell me how solar cells are made and the biggest output in volts and amps one can expect from one cell?—F.V., Darlington, Co. Durham.

▲ *So far work on solar cells has been largely experimental, and very little commercial development has taken place. You might be able to obtain further information from a journal dealing with electric and electronic development.*

## Soft solder

I am putting the finishing touches to LBSC's *Juliet* and I would like to know if soft solder is suitable for the fittings on the boiler. It is taken for granted, of course, that silver solder is better, but would soft solder be suitable on all parts but the superheater components?—S.D., Stoke-on-Trent.

▲ *Soft solder is not recommended for boilers. If it must be used, all the fittings and bushes should be threaded and screwed into the boiler and the soft solder be used mainly to stop any small weeping. On no account insert the bushes and rely on the solder alone to hold them in place.*

## Lap for cylinder bores

Will you please give me details of the best sort of lap to use on cast-iron cylinder bores of about 2¼ in. dia.?

The bores are reasonably true, but I wish to improve them and to add a fair degree of polish.—J.M.D., Boscastle, Cornwall.

▲ *The most rapid action can be obtained by using lead laps, but they are also relatively difficult to control.*

*You may prefer an aluminium lap made capably to expand by tapering the bore and fitting it to a tapered mandrel, screwed at the end for an adjusting nut. The lap must, of course, be split through at one place, and partly through at two or more equally spaced positions. For final lapping, it is quite in order to use a cast iron lap made and fitted in the same way.*

*Rough lapping may be done with carborundum paste, but for finer lapping aluminium oxide is suitable. It may be followed by still finer media to obtain a high polish, but this is not a practical essential. Separate laps should, of course, be used for the different abrasives.*

## Lady Kitty

I wish to obtain particulars of LBSCs *Lady Kitty*. Can you quote the issues of ME in which the "Words and Music" were printed, so that I may advertise for back numbers.

Are you able to supply information as to the suitability or otherwise of Eutectic 1801 silver type alloy for oxy-acetylene use in boiler construction?—B.W., Leamington Spa.

▲ Lady Kitty *was described in* MODEL ENGINEER *in* 1929 *in the issues for* 6, 13 *and* 20 *June.*

*Eutectic* 1801 *is quite suitable for use with the oxy-acetylene torch. The torch should be set to burn acetylene slightly in excess.*

## Vertical boiler

Can you please tell me of a firm which would supply me with material or parts to build a small vertical boiler about 4 in. dia. and 12 in. in height, preferably in copper, with multi-fire tubes similar to Stuart Turner *Progress* in the Twenties?—R.W., Swindon.

▲ *One of these firms would be able to meet your requirement: A. J. Reeves and Co., 416, Moseley Road, Birmingham 12; Kennion Bros Ltd, 7, Greenways, Hertford; Bond's O' Euston Road Ltd, 357, Euston Road, London, N.W.1.*


**MODEL ENGINEER EXHIBITION**

**The next Model Engineer Exhibition will be held at the Central Hall, Westminster, opposite Westminster Abbey, from 16-26 August 1961, excluding Sunday. An announcement about entry forms will be made later.**

# POSTBAG

*The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be paid for each picture printed. Letters may be condensed or edited*

## TANGYE MODEL

SIR,—I thought that possibly the enclosed photograph might interest you. The plate on the model reads: "Model Tangye Gas Engine c. 1898. Constructed by C. E. Milner from drawings and technical information provided by Messrs. Tangyes Ltd of Birmingham. Scale 1/3 full size."

The engine runs well, but the low tension magneto is merely a contact breaker and is connected to a trmebler coil and battery in the base.

I am a retired engineer aged 70 and have plenty of time to work on a model. This one took me just over 12 months.

Birmingham. C. E. MILNER

## KANSAS TO IOWA

SIR,—Thanks again for another good year of reading. I enjoy, of course, the news of steam miniature railroading in other lands as well as seeing that traction engines are being preserved in your land also.

This past September I was privileged to travel to the town of Mount Pleasant, in the state of Iowa, to witness the 11th annual reunion of the Midwest Old Settlers and Threshers Association where 100 or more of the old American-brand traction engines, including models up to one-half full size, were in steam and doing not only agricultural demonstrations, but sawmill operations as well. Two miniature working sawmills were in operation, and the smallest one was using an 8 in. circular saw blade for the cutter sawing lath from cedat posts..

Lawrence, Kansas. ROBERT A. STANNARD.

## THE BOY BETWEEN

SIR,—The illustration of a Thames steamer in Postbag of 1 December 1960, and the letter by Mr Bateman on December 29 giving the date as 1905, remind me of something my father once said about the penny steamers, which must have been earlier.

There seems to have been no direct contact between the captain and the engineer on the penny steamers because at a convenient point within earshot of the captain and engineer was stationed a small boy whose job it was to relay the orders.

A recollection of early rail travel in winter is worth a mention. I had an aunt of 85 who as a girl made a winter's journey from Kingston to London in fog. At one station a porter came along with a trolly loaded with metal bottles about 3 ft × 2 ft which were put in the carriage on the floor, to warm the occupants, one to each compartment.

London N13. A. N. BUCHANAN.

## CITY OF TRURO

SIR,—I, too, am one of the many who would like to see a series on a 5 in. *City of Truro*.

I have studied the matter a little, and I cannot agree with Martin Evans in Choosing a Prototype [December 1] that the locomotive would be difficult, though it would no doubt take longer to build.

Why should four cylinders be so much worse to make than two? There is only a very small amount of extra valve gear, and most of the cylinder work could be mass-produced. I say this after reading Martin Evans's remarks on a GWR Star ["Oh, those four cylinders!"].

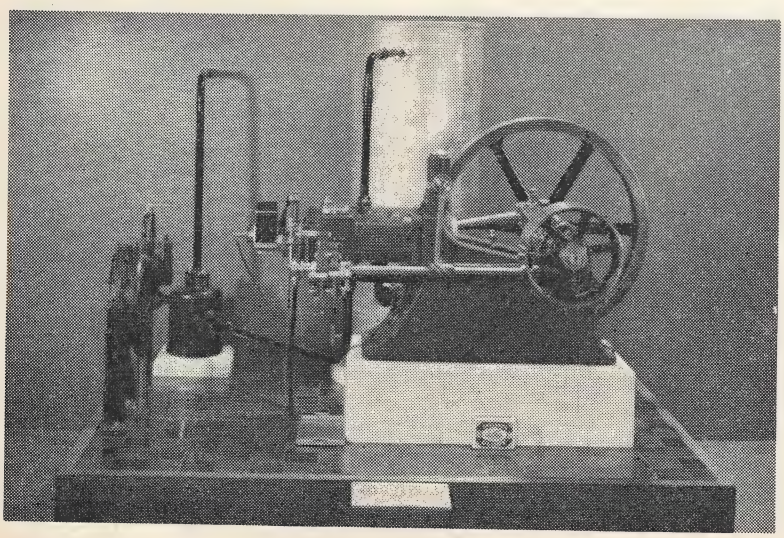
Salisbury, Wiltshire. L. BLAKE.

** What Martin Evans intended to convey was that a four-cylinder engine was a good deal more work than a two-cylinder, and more difficult, especially when a GWR type is selected, than a locomotive with two* outside *cylinders.*

*While it is true that a 5 in. gauge* CITY OF TRURO *would make a magnificent engine, there are a number of difficulties to be overcome, which would make the project more suitable for model engineers with considerable experience.*—EDITOR.

## VAUCLAIN COMPOUND

SIR,—In Queries of September 1, J.P.H., Rotherham, asked for information on the Vauclain balanced compound locomotive as formerly built by the Baldwin Locomotive Works. I am taking the liberty of sending a diagram of this valve



*At 70, C. E. Milner of Birmingham has "plenty of time to work on a model." He spent a year on his Tangye gas engine of the Nineties*

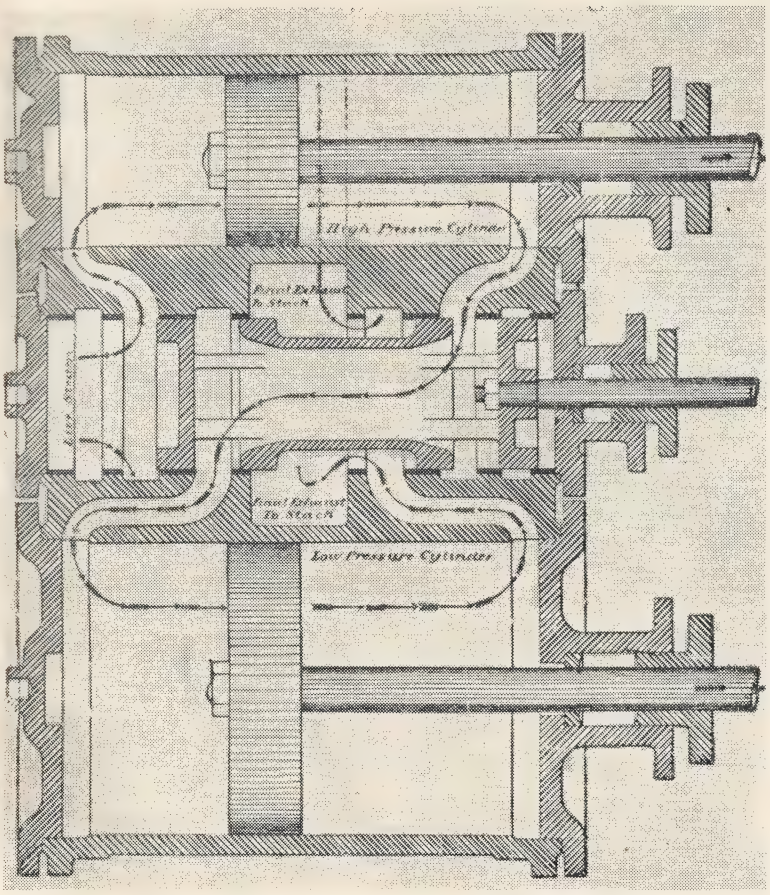
system in the hope that it will prove to be of some value to all who are interested in the steam locomotive.

In the Vauclain system the cylinders consist of one high-pressure and one low-pressure for each side of the engine, the ratio of the volumes, or piston, displacements being approximately 3 : 1.

The valve chamber is usually located between the high and low pressure cylinders, which are all cast in one piece, together with the half-saddle. The valve employed is of the piston type, perfectly balanced, and double-ported and hollow, as shown in the diagram.

The live steam from the boiler enters the steam chest from each end. Thus we have an " outside admission " valve, in opposition to the usual " inside admission " piston valve, generally used on " simple " locomotives. The path of the steam is clearly shown in the diagram, by the arrows.

As both the high and low pressure cylinders are proportioned to do the same work, both piston rods are of the same size and are connected to the same crosshead, which in turn is connected to the main rod. There is also provided (not shown) a by-pass, or " intercepting " valve, the purpose of which is to supply steam from the boiler to both high and low pressure cylinders for starting and pulling heavy trains up steep grades. In other words, the engine can be operated either as a simple or compound, by the flick of a lever.




*Mr P. S. Beekman, with the aid of the above diagram, explains the principle of the Vauclain compound engine*

Of the 15 or 20 different systems of compound locomotives in use in the USA in bygone years, I think the Vauclain system was the simplest, best designed, most reliable and probably the most widely used. It was especially efficient in that type of service where long runs with infrequent stops were commonplace, for it was in this kind of service that the compound locomotive was at its best.

As I have stated, the valve is balanced, except for the slight variation caused by the area of the valve stem at the back end. This variation is an advantage in case the valve or its connection to the valve rod should be broken, as it tends to hold them together. Cases are reported where compound locomotives of this system have hauled passenger trains long distances with broken valve stems, or broken valves, the parts being kept in their proper relation by the compression caused by the variation.

Chief Mechanical Engineer,
Gold Coast Railroad,
Florida. P. L. BEEKMAN.

## STEAM ROLLERS

SIR,—As a regular reader of ME and a member of the West of England Steam Engine Society (affiliated to the National Traction Engine Club), I have noted in your correspondence columns the steady withdrawal from active service of the steam road roller, especially during 1960.

Compared with the traction engine, the steam roller has not passed into the ranks of preserved engines in very large numbers, with the result that some interesting rollers have already been scrapped. With the increasing use of diesel power on road works, the displacing of the faithful steam roller is likely to be speeded up considerably in 1961.

A steam roller to my mind is just as interesting and useful a machine for preservation as any other form of steam road locomotive, and it is sad that some traction engine club members cannot raise the same enthusiasm for the steam roller as they can for the traction engine. Prices of rollers are rising, but many, in good working order, can still be had for much less than a decent traction.

The time is fast approaching when it will be rare to encounter a roller still active on road work. If we delay it will soon be too late to save anything worthwhile.

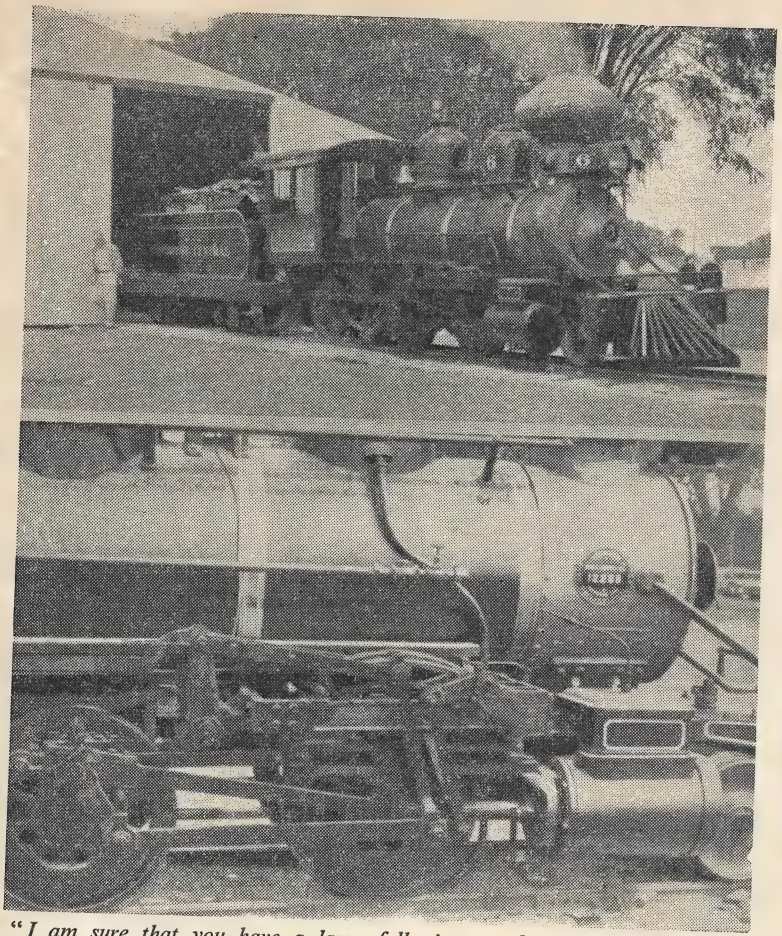
Exeter. A. G. COOMBES.

## " H.R." GAS ENGINE

SIR,—Mr D. E. Oliver asks [Postbag, 1 December 1960] about the initials " H.R." on his gas engine.

The engine is the " Robinson " (Horace Robinson's patent), and was on sale a few years before the turn of the century, so that it may well be over 60 years old. The patent concerned the feature to which Mr Oliver refers—the operation of the valve through an eccentric—and was taken out in 1893.

The Robinson engine was not the only one to use the arrangement, as Messrs Norris & Henty—later Norris,



*"I am sure that you have a large following over here, and we all have to depend on ME for our live steam news." Writing from Illinois, Donald P. Dameies sends these pictures. Top: The Surrey, Sussex and Southampton H6 built by Baldwin in 1891 (3 in. gauge, 12 × 16 in cylinders, 160 p.s.i.) is run by the Midwest Old Settlers and Threshers Association on its Midwest Central Railroad at Mt Pleasant, Iowa. Above: One of the original engines with the Southern valve gear in the early days of outside valve motion*

Henty & Gardners Ltd—also sold, about the same time, small-power gas engines with exhaust valves driven through an eccentric.

As a modeller of gas engines, I would like to ask if any of your readers know the whereabouts of an old Stockport gas engine of about 1895-1905, made by Andrew & Co. of Reddish, of which photographs might be taken. Perhaps someone may have a makers' catalogue, drawings, or illustrations.

This smaller-powered engine was governed by a simple oscillating blade on the gas valve lever, and was made before Messrs Andrew were absorbed by Richard Hornsby & Sons in 1906.

Hemel Hempstead, Hertfordshire. K. C. GRAY.

## ME IN AMERICA

SIR,—Here are two photographs of one of the preserved and restored engines which are becoming more popular in the States all the time. I thought that the valve motion might be of interest to other readers.

I was pleased to read that Martin Evans is planning to run a series on an American switcher. This should be popular with North American readers.

I am sure that you have a large following over here, and we all have to depend on M.E. for our live steam news. We are interested in any steam locomotive, but an article on one of our own types would surely be most welcome.

Lena, Illinois. D. P. DAMEIES.

## CLUB DIARY

**February 9 Rugby SMEC.** Debate, should motorways be turned into railways.

**February 10 Thames Shiplovers' and Ship Model Society.** Model makers' meeting at Oddi's at 7 p.m.

**February 10 JIE.** Lecture on the detection of radiation by Mr G. Ballard at Pepys House, 14 Rochester Row, London, SW1 at 7 p.m.

**February 10 Traction Engines.** Film and colour slide show at the Berkshire County Council staff Canteen, Abbey Street, Reading at 7.30 (see Club News for February 9).

**February 11 SMEE.** Annuzl meeting at Caxton Hall, Westminster at 2.30 p.m.

**February 11 York SME.** Film show at the Rechabite Buildings, Clifford Street, York at 7 p.m.

**February 13 Clyde Shiplovers' and Model Makers' Society.** Film night at the Kelvingrove Museum and Art Galleries.

**February 13 JIE (Sheffield District).** Talk by Mr D. Eyres in punch card operation in the passenger transport world at Livesey Clegg House, 44 Union Street, Sheffield at 7.30 p.m.

**February 13 Historical Model Railway Society.** Lecture on the development of the 4-4-0 by Mr H. H. Robinson at Keen House, Calshot Street, London N1 at 7 p.m.

**February 13 Sutton Coldfield and N. Birmingham MES.** Film show at the Swan Inn, High Street, Erdington.

**February 14 City of Leeds SME.** Brazing meeting at Kidacre Street.

**February 15 Birmingham SME.** Railway reminiscences by Ernie Guy at the White Swan Inn, Edmund Street at 7.30 p.m.

**February 16 Bristol SMEE,** Meeting at the Mary Room, of the YWCA.

**February 16 Romford MEC.** Film show at the Red Triangle Club, Romford at 8 p.m.

**February 16 Harrow and Wembley SME.** Talk on ship modelling at Heathfield School, Harrow at 8 p.m.

**February 17 JIE.** Talk by Mr H. S. Walff on Broengineering at Pepys House, 14 Rochester Row, Westminster SW at 7 p.m.

**February 17 Greenwich and District SMS.** Talk by Mr L. C. Boyce on shipping on Thames.

**February 18 Ramsgate and District Model Club.** Film show of technical subjects at the Ambassador Restaurant, Turner Street, Ramsgate.

**February 18 SMEE.** Visit to the BTC museum at Clapham.

**February 18 Thames Group Marine Modelling Society.** Talk on miniature modelling by Surgeon Commander Willoughby at the Reindeer Hotel, Wakefield Street, Gravesend at 7.45 p.m.

**February 21 Northampton SME.** Film show at the Kingsthorpe Community Centre at 8 p.m.

**February 21 City of Leeds SME.** Demonstration of workshop practice by Mr J. Hainsworth.

**February 23 Rugby SMEC.** Shipmodelling; a talk and demonstration by Mr Field and Mr Pariser of Birmingham.

**February 24 Thames Shiplovers' and Ship Model Society.** Meeting at the Baltic Exchange at 6.30 p.m.

**February 25 SMEE.** Lecture by Mr H. V. Steele and Mr H. S. Weston at 28 Wanless Road, SE24 at 2.45 p.m.

**February 25 Historical Model Railway Society (Midlands and the SW area).** Lecture by Mr G. Iliffe Stokes at the Midland and Royal Hotel, Gloucester, on Scenic Modelling at 3 p.m.

**February 25 York SME.** Presentation of cups for year's best work and year's best photograph at the Rechabite Buildings, Clifford Street, York, at 7 p.m.

**February 27 Clyde Shiplovers' and Model Makers' Society.** Talk on the Clan Line at the Highlanders' Institute, Elmbank Street.

**February 28 City of Leeds SME.** Brazing meeting at Kidacre Street.

**February 27 Sutton Coldfield and W. Birmingham MES.** Workshop night at the Swan Inn, High Street, Erdington.

# GAMAGES

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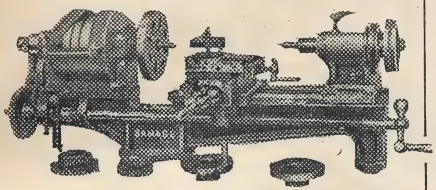

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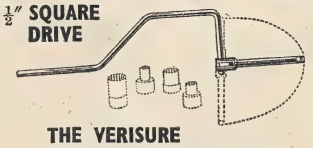

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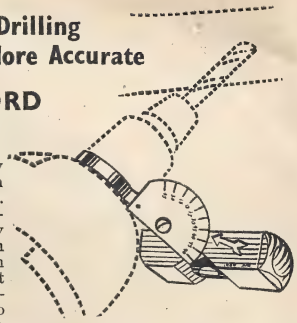

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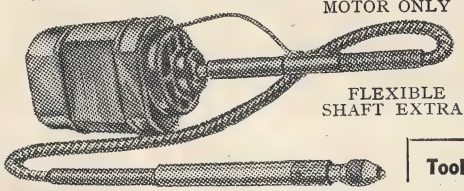

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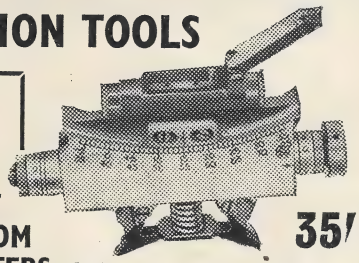

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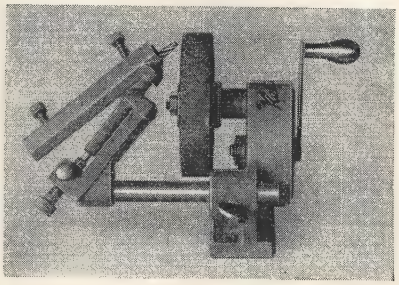

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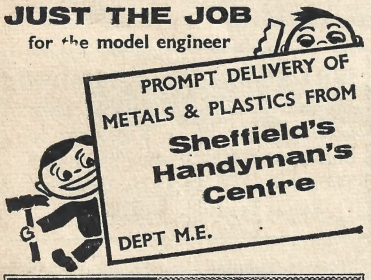


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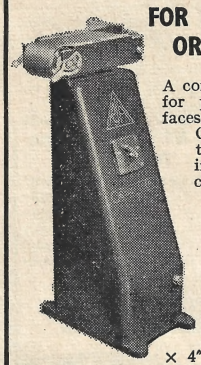

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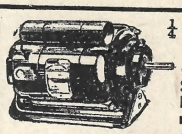

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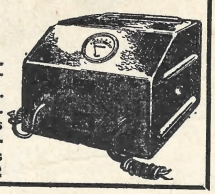

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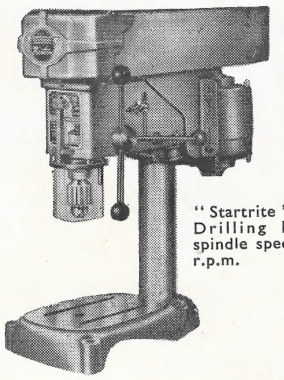
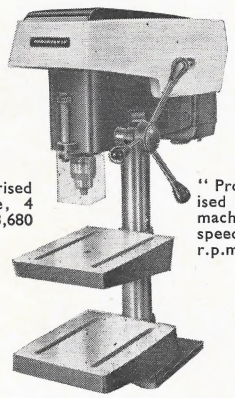


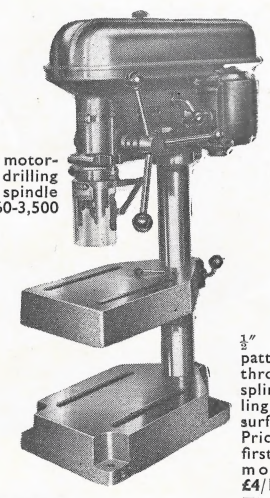
"Startrite" motorised Drilling Machine, 4 spindle speeds 460-3,680 r.p.m.

½" capacity American PA II drill chuck, ball thrust bearings, dual spiral tension springs. Swing away chuck guard. Drills to centre of 13⅛".
Price **£35/8/-** 3-phase
or First Payment **£3/10/9**
8 monthly payments of **£4/6/10**



"Progress" motorised bench drilling machine, 4 spindle speeds 460-3,500 r.p.m.

½" capacity American pattern chuck, quick speed change, adjustable table, attractive two-tone finish rectangular tilting table. Price **£39/10/-** 3-phase or first payment **£3/19/-** and 8 monthly payments **£4/16/11.**



"Pacera" Driltru motorised drilling machine, five spindle speeds 500-4,800 r.p.m.

½" capacity American pattern chuck, large throat depth 7⅝", splined spindle and drilling sleeve, large working surface to table and base. Price **£40** 3-phase, or first payment **£4** and 8 monthly payments **£4/18/1.**

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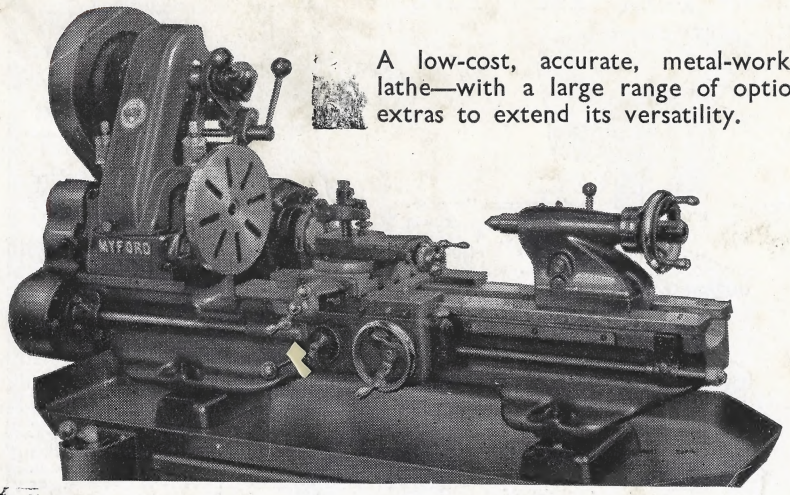


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